



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

G-Z 88

HARVARD UNIVERSITY



**GEOLOGICAL SCIENCES
LIBRARY**

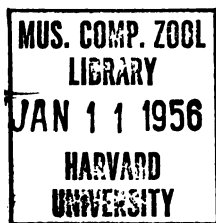
G-Z 88

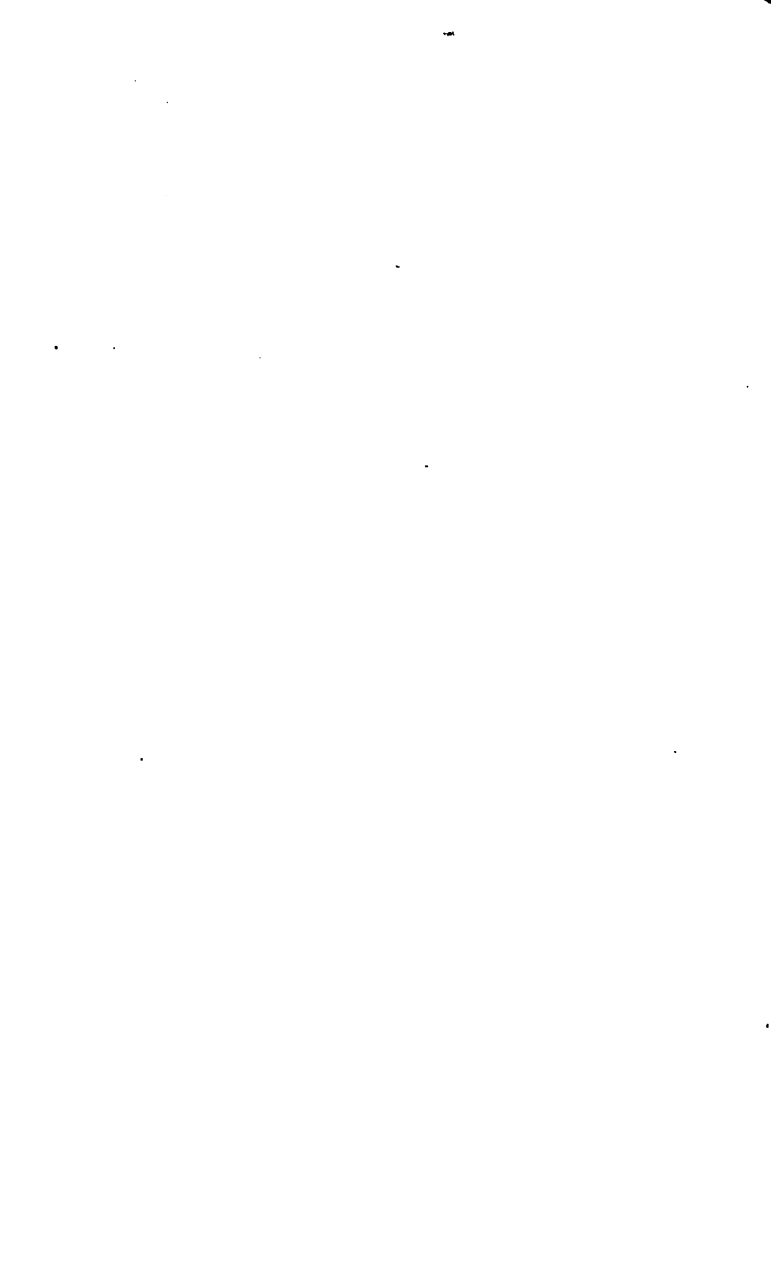
HARVARD UNIVERSITY



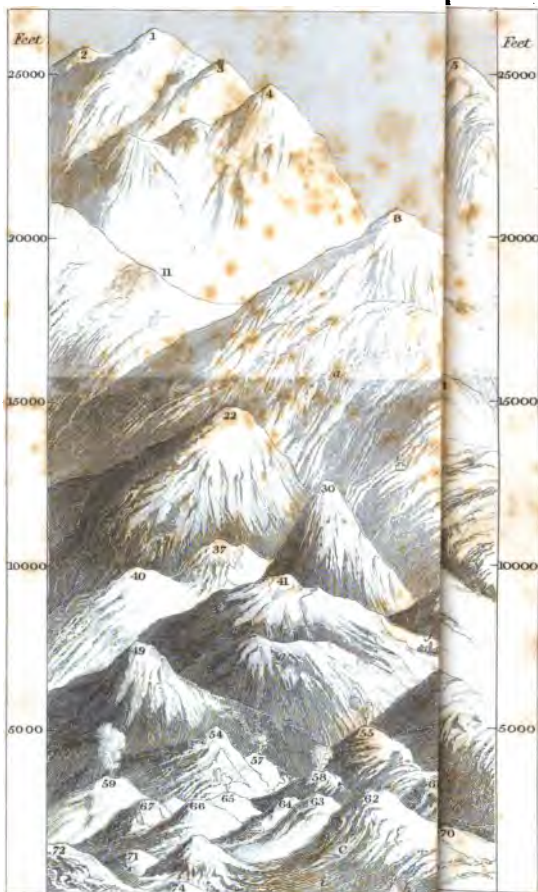
**GEOLOGICAL SCIENCES
LIBRARY**

Transferred to
CABOT SCIENCE LIBRARY
June 2005









1. Dhawalgiri	12. Pass in the Andes	23. PELVOUX
2. Kinchin-jinga	13. Mt. St. Elie	24. Ophir
3. Jewahir	14. Ararat	25. JUNG FRAU
4. Various Peaks	15. Sangai or Mexus F.	26. MT VISO
5. Sorata	16. Popocatepetl F.	27. Jayne's Peak
6. Aconcagua F.	17. Tunguragua F.	28. Soehonda M.
7. Chimborazo	18. MT BLANC	29. Vole in Spain
8. Hindoo Koosh	19. MT ROSA	30. Teneriffe
9. Antisana F.	20. MT CERVIN	31. MT CENIS
10. Cotopaxi F.	21. Nevada de Mexico	32. MULHACEN
11. Pass in Thibet	22. G. cesh	33. MT PERDU

20. ST COTHARD
 21. Mts of Egypt
 22. ISAC IN BALLOON
 23. Mt & Bonpland
 24. Flight of
 25. Andor
 26. different
 27. in this —
 28. V. Foligno.

RECREATIONS

IN

PHYSICAL GEOGRAPHY:

OR,

THE EARTH AS IT IS.

BY

ROSINA M. ZORNLIN,

AUTHOR OF

"RECREATIONS IN GEOLOGY," "THE WORLD OF WATERS," ETC.

FOURTH EDITION, REVISED.

LONDON:

JOHN W. PARKER AND SON, WEST STRAND.

M. DCCC. LI.

G-Z 88

G8

59

.286



*From the Library of
Mrs. Ellen L. L. L.*
BY THE SAME AUTHOR:

Outlines of Physical Geography. 10d.

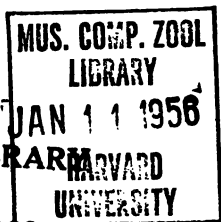
World of Waters; or, Recreations in Hydrology.
Second Edition. 6s.

Recreations in Geology. Second Edition. 4s. 6d.

Bible Narrative, chronologically arranged, in the words of the Authorized Version; continued by an Account of the Jewish Nation, and forming a Consecutive History from the Creation to the Termination of the Jewish Polity. Third Edition, with Maps. 7s.

What is a Voltaic Battery? 2s. 6d.

The Roman-Catholic Chapel; or, Lindenhurst Parish. A Tale. 2s. 6d.



KUMMEL LIBRARY

AUG 04 1986

HARVARD UNIVERSITY

P R E F A C E.

ON a former occasion, we laid before our readers a concise view of Geology, or the Earth in its former condition; the object of the present volume is to offer a general outline of the EARTH AS IT IS.

Geology may be compared to Ancient History, around which distance of time and partial obscurity throw the halo of classical interest. PHYSICAL GEOGRAPHY, on the other hand, resembles Modern History, or rather, perhaps, records of daily recurring events—events in which our own personal interests are concerned. And should it be thought that our present subject does not possess the peculiar charm with which antiquity invests the science of Geology, it will be found, that it does not yield to that, or to any other, in importance, or in the interesting views it unfolds.

Our design being to give a general outline of the Earth in its present condition, both as regards the laws by which it is governed, and its more striking natural features, it has appeared to us, that this end would be more effectually attained by uniting Physical with Descriptive Geography. We have, therefore, not confined our attention to the subjects usually embraced in treatises on Physical Geography, but have superadded a brief description of the leading features of the terrestrial globe, collated from the

most modern and authentic sources. And it is hoped, that by this arrangement, each branch of our present subject will tend to elucidate the other; and, that not only will the science of Physical Geography appear in a new and very generally interesting light, but also, that a more comprehensive view of the Earth as it is, will be obtained; and the desideratum of a concise and popular outline of Natural Geography in its present advanced state, be in some measure supplied.

It would be almost an endless task to enumerate the various authorities from which valuable information has been derived; but the Author cannot refrain from mentioning more especially the writings of Whewell, Leslie, and Trail; the Journals of the Royal Geographical Society; MURRAY'S *Encyclopædia of Geography*; and the Reports of Dr. Richardson, Colonel Sykes, and others, to the British Association of Science.

June, 1840.

It may be desirable to state, that in this fourth edition of RECREATIONS IN PHYSICAL GEOGRAPHY, such alterations and additions have been made, as the progress of scientific research and geographical discovery have appeared to demand. The sources from which this information has been collated are too many and too various to be here specified.

July, 1851.

CONTENTS.

CHAPTER	PAGE
I. Nature and Advantages of Physical Geography . . .	1
II. The Earth; Its Position in the Universe, Figure, Magnitude and Density—General Structure of its Surface—Phenomena of Earthquakes and Volcanos .	6
III. General Distribution of Land and Water—Mountains, Valleys, Plains—Table of Heights of Mountains, &c.	13
IV. Distribution of the Waters of the Globe—Ocean—Inland Seas—Lakes—Rivers—Springs	24
V. The Atmosphere; its Constitution, and Weight or Den- sity—Evaporation—Dews—Mists—Clouds—Rain— Winds	32
VI. Climate	44
Key to Plate IV.	58
VII. Geographical Distribution of Plants	62
Key to Plate V.	77
VIII. Geographical Distribution of Animals	81
IX. Geographical Distribution of Man	110
X. General Features of the Earth—The British Isles . .	116
XI. THE OLD WORLD—Central Band of Mountains—The Pyrenees—Spain and Portugal—France—The Mari- time Alps—Italy	142
XII. Alpine System—Switzerland—The German Highland —Carpathian Mountains—Dalmatian Range—Balkan Mountains—Greece and Turkey	157

CHAPTER	PAGE
XIII. European Lowland—Belgium—Holland—Denmark— Lower Germany—Poland—Russia—Northern High- land of Europe—Scandinavia	174
XIV. Central Line of Mountains in Asia—Asia Minor— Syria—Palestine—Arabia—Armenia—Caucasus Range—Persia	196
XV. The Hindoo Koh—Himalaya Mountains—China— Indo-Chinese Countries—Hindustan—Islands of Asia	220
XVI. Northern Asia—Kuenlun Mountains—Altai Moun- tains—Uralians—Tibet—Siberia	242
XVII. Volcanic Region, from the Aleutian Islands to the Moluccas—Volcanic Line, from Formosa to the Caspian—Volcanic Region, from the Caspian to the Azores—Icelandic Volcanic Region	252
XVIII. General Features of Africa—African Islands—African Volcanic Region	279
XIX. THE NEW WORLD—General Features of North America —North American Islands	306
XX. General Features of South America—New South Shet- land	323
XXI. General Features of Central America—Mexico—Texas —Guatemala—West Indian Islands.	350
XXII. Volcanic Region of America	361
XXIII. OCEANICA—Australia—New Zealand—Antarctic Re- gions—Polynesia—Oceanic Volcanic Region—Con- clusion	376
INDEX	407

ILLUSTRATIONS.

Plate of Mountains.....	<i>To face the Title-page.</i>
Ships receding from the shore	7
Map of the World	13
Plate of Rivers.....	27
Fall of the Tees	29
Plate of Geographical Distribution of Plants	62
The Fan-Palm.— <i>Corypha Umbraculifera</i>	66
Plate of Geographical Distribution of Animals	81
Painted Lady Butterfly	89
Plate of Heads and Craniums of the Human Races	110
Vale of Glen Coe.....	122
British Oak.— <i>Quercus robur</i>	130
Scotch Fir.— <i>Pinus sylvestris</i>	135
Maize	149
Olive.....	150
Cotton Plant	155
Via Mala	161
Grotto of Antiparos	168
Pass between Scogstadt and Vang	183
Norway Spruce Fir.— <i>Abies excelsa</i>	187
Dwarf Willow	195
Cedars of Lebanon	198
Date Palm.— <i>Phoenix dactylifera</i>	204
Approach to Petra	208
Mount Ararat	215
Tamarisk Tree, on the Ruins of Babylon	217
Plantain.— <i>Musa Paradisaica</i>	231
<i>Rafflesia Arnoldi</i>	239
White Birch.— <i>Betula alba</i>	250
Birs Nimrood	263
Fissures near Polistena	270
Circular Hollows in the Plain of Rosarno	270
<i>Ziziphus Lotos</i>	286
Nests of the Social Weaver Bird	294
Mangrove.— <i>Rhizophora gymnoriza</i>	296
Leaf and Fruit of the Butter-Tree	299
Fall of the Passaic, at Patterson	314
Weymouth Pine.— <i>Pinus strobus</i>	316
Tripe de Roche	318
Natural Bridge of Icononzo	331
Scale of Vegetation in Equinoctial America	335
Eta Palm.— <i>Mauritia flexuosa</i>	340
The Agave, as prepared for producing Pulque.....	352
Chocolate Tree.— <i>Thebroma cacao</i>	356
Section of a Vein of Bituminous Coal, in the Island of Cuba	358
Jorullo	373
Govatt's Leap, Blue Mountains.....	378
Cape Pillar, Van Diemen's Land	382
Australian Forest Scenery	386



PHYSICAL GEOGRAPHY.

CHAPTER I.

NATURE AND ADVANTAGES OF PHYSICAL GEOGRAPHY.

The great globe itself.—SHAKSPEARE.

FEW subjects connected with science are of more universal interest, or of greater importance to mankind, than that of Physical Geography, and yet few, perhaps, have until within the last few years so little arrested popular attention. This is, however, a circumstance for which it is by no means difficult to account, being in a great measure, if not wholly, attributable to the comparatively recent elevation of this branch of natural philosophy to the dignity of a science, and to the consequent generally prevailing ignorance of its real objects, of the highly interesting views it unfolds, and of its great practical utility.

PHYSICAL geography directs our attention to the general structure of the terrestrial globe, to the atmosphere by which it is surrounded, and to the distribution of organized beings on its surface. Nor does it stop here; it is not only “a rich store-house of facts which all other researches supply, a grand repository to which all those facts are referred;” but from this vast accumulation of observed phenomena, it attempts to discover the laws by which the whole earth is governed, and to reduce to a few general principles the infinite variety of appearances displayed in the works of nature.

To arrive at a perfect system of physical geography, we ought, therefore, to be acquainted with the phenomena presented by every portion of the earth, with every animal, every plant on its surface, every mineral contained in its bosom, every variation in its atmosphere.

Pleasant to know, and worthiest to be all
 Had in remembrance always with delight;
 But what created man can comprehend
 Their beauties, or the Wisdom Infinite
 That brought them forth, but hid their causes deep!

Yet, though it is true that, in its most extended sense, physical geography includes almost every branch of natural philosophy, there is nothing in this science to deter the uninitiated from its pursuit. The student is neither called upon to collect facts, nor to draw inferences from facts which have been observed by others,—this has been already accomplished for him; he is merely invited to become acquainted with a few general principles, and to observe the application of these to the works of nature.

Whoever looks abroad into the natural world, cannot but be sensible that it teems with objects calculated to inspire delight and admiration; nor are any, even the least instructed, if gifted with an observant mind, excluded from a participation in these feelings; the Book of Nature is open to all—

She spreads her glories on the earth,
 And all her children, from their birth,
 Are joint heirs of the whole.
 Yea, long as Nature's humblest child
 Hath kept her temple undefiled
 By sinful sacrifice;
 Earth's fairest scenes are all his own,
 He is a monarch, and his throne
 Is built amid the skies!

Some acquaintance, however, with the laws by which the universe is governed, tends eminently to increase and elevate the gratification arising from the contemplation of the objects which surround us on every side.

. Earth has still
 Some traces of her youthful beauty left;

and though the perception of this may be open to all, the harmony and glory of creation can be fully appreciated only by those who are in some measure acquainted with the laws of nature. The study of these laws possesses at the same time, the advantage of fixing the mind on nature's Ruler; for a law not only necessarily implies a lawgiver, but if these laws

are found to be uniformly and universally carried into effect, we are further led to the perception of the continually watchful Providence, by which the natural world is governed and sustained; and, consequently, to that both of the Omnipotence and Omnipresence of the Deity. We trace the hand of creative wisdom on every side; each object teems also with evidence of the supreme goodness of the Author of Nature; all things appear arrayed in new and beautiful colours, and order and harmony are found to pervade the whole. Science, when thus pursued, is not "falsely so called;" for

Philosophy baptized
In the pure waters of Eternal love
Has eyes indeed; and viewing all she sees
As meant to indicate a God to man,
Gives Him the praise, and forfeits not her own.

The practical advantages to be derived from physical geography are very considerable, more especially to a nation possessing extensive colonies in various quarters of the globe. It is not every country, nor even every part of a country, that possesses equal advantages for the habitation of man; on the contrary, most countries present certain natural divisions, materially differing in climate, and in their various productions, some portions being usually more favoured by nature than others. Diversified, however, as is the surface of the earth, a general agreement is observed to prevail in corresponding climates and situations; and thus, if we are acquainted with the facts relative to one country, or to a certain portion of the earth's surface, we may form some general idea of the capabilities of any other portion, similarly, or nearly similarly, circumstanced. Physical geography, by taking into account all these agreements and diversities, and by deducing from various phenomena, actually observed in some particular localities, the class of phenomena likely to occur in others, is, in its practical application, of the greatest utility; for it thus enables us to judge of the fitness of any country to provide man with food, and consequently for his habitation; and forms a guide to direct the settler in the choice of the place in which to fix his abode, and also in the selection of crops, adapted to succeed in the region in which his lot may be cast. Ignorance on these points has led to much disappointment

and many futile attempts, and there can be little doubt that the more this science is generally known, the less liable shall we be to meet with failure.

Almost every region of the globe is provided with vegetable productions, all of which require certain conditions to arrive at perfection. Thus, some will thrive in a moist, some in a dry climate; some in the hot regions of the earth, some in the cold, and some only in the temperate,—the greater portion being naturally confined within certain limits. By cultivation, man has been enabled to extend the natural limits of numerous species of plants, and to give them a wider range on the earth's surface. This, however, can only be advantageously effected by attending to the conditions they require of soil, temperature, and moisture. An acquaintance with such particulars, and with all the circumstances under which valuable plants will succeed, becomes, therefore, of paramount importance to all settlers in distant or newly acquired lands; nor is it without its utility in any attempts to introduce new species into our own country.

The narratives of travellers, their surprising adventures, the wonders they relate of distant lands, form, both in our earliest youth, and also in more mature age, some of our most favourite works of recreation. In imagination we accompany the enterprising wanderer across the wide ocean, with him ascend the lofty and snow-clad mountain, and trace the river to its source, or descend into the fertile valley, clothed with rich vegetation and watered by the broad spreading stream; we traverse the parched and sandy desert, or penetrate into the dense forest; we meet with numberless and varied tribes of animals and plants, some approaching in character to the productions of our own land, others presenting new and singular forms. Such descriptions of small and detached portions of the earth's surface, kindle in us a desire to become acquainted with all that is remarkable on the face of the globe; in short, with all that descriptive geography (for such in fact it is, though, perhaps, little thought of under that name), can impart to us. Nor will the inquiring mind rest here; it will further aspire to obtain some knowledge of the causes which give rise to the various phenomena thus brought before its

view, and of the laws by which they are governed. Here then physical geography comes to our aid ; and not only does it afford an explanation of remarkable phenomena of rare occurrence, displayed, perhaps, in some remote region of the globe, but also of various familiar but interesting facts in natural history, daily passing before our view, though not unfrequently almost without notice, and without our having any perception of the constancy of the laws by which they are governed.

This science, therefore, is very excursive in its range, not only directing our attention to the more striking and wonderful, because more uncommon, phenomena of the natural world, but leading its student to observe and to reflect, to derive subjects for thought and admiration from all that surrounds him ; thus enhancing his pleasure, both in the perusal of every description of the earth's surface, and in the contemplation of all the works of creation. Evident traces of beneficent design present themselves on every side—the student himself may perceive them ; the more he knows the more does he wish to know,—his spirit becomes athirst for knowledge ; and it is well that it should be so,—for

The desire which tends to know
The works of God, thereby to glorify
The great Work-master, leads to no excess
That reaches blame, but rather merits praise
The more it seems excess.

He has entered on a vast and inexhaustible field, full of treasures, which those who seek shall find, hidden treasures of wisdom, power, and goodness : and if these are pursued with a proper spirit, he will learn that “the mind employed on that which is great, becomes itself greater.”

CHAPTER II.

THE EARTH; ITS POSITION IN THE UNIVERSE, FIGURE, MAGNITUDE, AND DENSITY; GENERAL STRUCTURE OF ITS SURFACE.—PHENOMENA OF EARTHQUAKES AND VOLCANOS.

. This earth, a spot, a grain,
 An atom, with the firmament compared,
 And all her numbered stars. YOUNG.

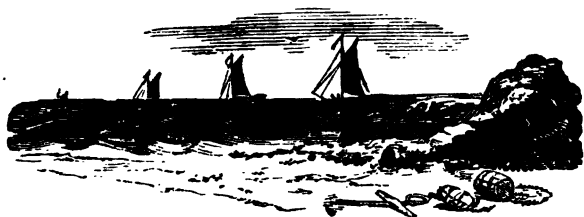
THE earth belongs to a system of planetary bodies, of which the sun forms the centre, and which is hence termed the solar system. We are at present acquainted with twenty principal or primary planets which revolve round the sun, and probably nineteen secondary planets, called moons, or satellites, revolving round the planets of which they are the attendants. The orbit of the earth, or path in which it moves round the sun, is elliptical, though it differs very little from a circle; the mean, or average distance of the earth from the sun, being ninety-five millions of miles.

The earth is of a globular form; its figure, however, is not that of a perfect sphere, but somewhat elliptical, or flattened at the poles, though the flattening, or difference of diameter, is so trifling, "that if a model of similar proportions were turned in wood," says Sir John Herschel, "and placed before us on a table, the most correct eye or hand would not detect the deviation from the spherical form."

The globular form of the earth is proved by the circumstance that ships steering in a general direction, either eastward or westward, arrive again at the point of departure. Few individuals, it is true, have it in their power to verify this in their own experience, but there is another mode of observation, by which many may have the opportunity of actually perceiving the *shape* of the earth; this cannot, however, be accomplished with certainty on land,—the hills, trees, and other objects, which diversify its surface, and

break and vary the line of the horizon, although bearing a most minute proportion to the whole earth, are, nevertheless, too considerable with respect to ourselves, to admit of our forming any judgment of the whole. But with the surface of the sea the case is otherwise; if we stand upon the sea-shore, we observe the surface of the ocean, not losing itself in misty distance, but terminated by a sharp, clear, well-defined line, or *offing*, as it is called, which constitutes the visible horizon. If we sail out of sight of land, this offing extends in a circle round us, of which our station in the vessel forms the centre. The appearance of this visible horizon, or sea-offing, is a consequence of the curvature of the surface.

That such is the case, is in fact proved by the phenomena exhibited by vessels receding from the shore, and sailing beyond our visible horizon.



The vessel, as it recedes, diminishes in size, but the whole is visible, until it reaches this water-line. Beyond this, though the masts and sails still remain in view, the hull of the ship is below the horizon; the portion of the ocean on which it is floating, being concealed from our view by the spherical surface of the sea, which protrudes between the hull and ourselves. If the vessel proceed a little further, the lower sails disappear, and only the upper are descried; and at length the whole is lost to our view. If, however, we immediately ascend some eminence, (the mast of a ship, if at sea—a tower, or the upper rooms of a house, if on land,) the vessel will again be visible, the elevation we have reached enabling us to see to a greater distance; and this will be in exact proportion to the height above the water, both of the object and of

the observer. It is on this principle that, when a vessel is outward-bound, and—

The sailor sighs as sinks his native shore,
And all its lessening turrets blueely fade:
He climbs the mast to feast his eyes once more.

When the eye is elevated six feet above the water, an object may be seen on its surface at the distance of three miles. Two points, each ten feet above the level of the water, cease to be visible to each other at a distance of eight miles. If we ascend any great elevation, such as the Peak of Teneriffe, Mowna Roa, (in the island of Hawaii, one of the Sandwich group,) or any other mountain commanding a vast extent of ocean, the distance at which any object is visible is proportionably increased, and the observer commands a much larger portion of the earth's surface. Thus, from the Peak of Teneriffe, or from Mowna Roa, a four-thousandth part of the whole surface of the earth is visible. In the celebrated æronautic expedition of MM. Biot and Gay Lussac, to the height of 22,900 feet above the level of the sea, the visible area displayed to their view, consisted of a sixteen-hundredth part of the earth's surface. On ascending to great elevations, while the absolute visible range, or quantity of the surface seen at once, has increased, the apparent size of the earth will have sensibly diminished. The visible horizon invariably extends in a circle round the observer: the same appearances being observed universally, in all parts of the earth's surface that have been visited by man. Now, the figure of a body, which, however seen, appears always circular, can be no other than a sphere, or globe.

The earth, as already stated, is not a perfect sphere, but a spheroid; its ellipticity, or the deviation in its figure from that of a perfect sphere, being equal to about one three-hundredth part; the compression at the poles being estimated at twenty-six miles in the diameter of the whole earth. Its greater or equatorial diameter is, therefore, 7926 miles, nearly, and the polar diameter about 7899 miles. The equatorial circumference of the earth is a little less than 25,000 miles.

The revolution of the earth on its axis is performed in a natural day, or, more correctly speaking, once in 23^h 56' 4'';

any point on its equator having a rotatory motion of more than 1000 miles per hour. This velocity gradually diminishes as we approach the poles, where it altogether ceases. In the parallel of London, the rate of this motion is 648 miles in the hour. Whilst

The planet earth, so steadfast though she seem,

is thus revolving on her axis, she has also a progressive motion in her orbit, and is therefore at the same time passing through space with almost inconceivable velocity: for, the length of the earth's orbit being estimated at 600,000,000 miles, her motion must exceed 68,400 miles in the hour.

The subject of the density of the earth has long occupied the attention of the learned. It is supposed to increase towards the centre, the average density of the rocks on the surface scarcely exceeding two and a half times that of water, whilst the mean density of the whole earth is equal to about five times that of water.

The rocks on the earth's surface are, as we have seen in our review of geology,* divided into two great classes, the aqueous and the igneous. Aqueous rocks are such as appear to have been formed by gradual deposits in water, and to have become more or less consolidated, or hardened into solid rock: such are sandstones, clays, limestones, &c. Igneous rocks are such as appear to have been formed through the agency of heat, by the melting down or fusion of the materials of which they are composed. The principal rocks of this class are granite, basalt, lava, &c.

Granite is a very universally-diffused rock; not that it appears at the surface in every locality, being in many places concealed from our view by beds of aqueous rocks of enormous thickness; but it is supposed to constitute the base on which all other rocks have been deposited. In many places, however, it towers pre-eminently above all other rocks; thus forming the summits of some of the loftiest mountains on the face of the globe.

The aqueous rocks, which are also called stratified, are arranged in four divisions, metamorphic, primary, secondary, and

* *Recreations in Geology*, 2nd edition, pp. 80, 81.

tertiary. The metamorphic are very widely spread over the earth's surface, almost all lofty mountain ranges being in part formed of rocks of this description. They are the principal, though by no means the sole depositories of metallic ores, but are devoid of fossils. The primary, secondary, and tertiary rocks—which again have their appropriate subdivisions, each characterized by distinct assemblages of organic remains—are of less universal occurrence, and frequently vary in their composition in different localities. Allowing, however, for these local diversities, a general correspondence is observable in the structure and arrangement of rocks in all parts of the earth, and indications everywhere present themselves, that similar agency has been employed in the formation of the whole.

A layer of alluvial soil, or of soil deposited by water, &c., and of recent formation, usually constitutes the upper coating of the earth's surface, especially in plains and valleys. This deposit is chiefly formed of particles abraded, or worn from older rocks, by the action of water, of the atmosphere, or of electricity; the whole surface of the earth being thus in a greater or less degree in a state of perpetual change.

. . . Within this wide great universe
Nothing doth firme and permanent appeare,
But all things tost and turned by transverse.

Water is a very powerful and active agent in altering and variously modifying the surface of the earth. The atmosphere, also, effects great changes on rocks; the differently shaped summits of mountains and hills owing much of their form to the destroying influence of the weather, which acts with varied effects on differently constituted rocks. Electricity, again, both directly and indirectly, produces an infinity of changes. When we speak of electricity, however, we must not be understood as referring solely to the more striking effects of the electric fluid, but rather to its silent and unobserved operation; which, in the economy of nature, is far more important than the former, though vast effects are occasionally produced by lightning. Thus, at Cayamba, in Colombia, about forty years ago, the lightning rent a cliff in its entire length, and precipitated a mighty mass into the river Huallaga, whose course was at the time obstructed:

and the river now forces its way, with much violence and uproar, through the massive fragments of the shattered cliff.

But it will be evident that the changes produced by the above-mentioned agents (at least in their external operation) are limited to the wearing away, and consequent lowering, of the more elevated parts of the earth's surface, and that all appear to have a tendency to reduce the whole to one general level. We must, therefore, look for some other agent, some opponent force, to counteract these effects, and accomplish the more remarkable work of elevating mountain ranges, and of raising land above its former level. Such is subterranean heat, displayed in the phenomena of earthquakes and volcanos: and probably also, although less obviously, in the gradual rise which is taking place in some regions. That a connexion exists between earthquakes and volcanos, has been proved by several well-authenticated facts; and that both owe their origin to subterranean heat is generally admitted, though the mode of its operation may be regarded as still involved in obscurity. The disturbances it produces on the earth's surface may, however, be regarded as some of the most important phenomena which it belongs to physical geography to describe.*

Some of our readers may, nevertheless, not be aware of the magnificent scale on which the energy of subterranean heat is at present developed on the surface of the globe; these commotions in the earth's crust—though, on account of the dreadful catastrophes to which they occasionally give rise, almost universally regarded as appalling phenomena—being perhaps very generally considered as detached events of rare occurrence; remarkable, it is true, from the destruction of property, and awful loss of life, with which they have in many instances been accompanied, but of no further account in the natural world. Nay, in this highly favoured island, we are so far removed from the theatre of volcanic action, that the very circumstance of these powerful agents being continually at work in great force, in various parts of the globe,

* The consideration of these phenomena is included in the department of physical geography; the application of their effects, as illustrations of changes on the earth's surface, belongs to geology.

Map

of the

WESTERN HEMISPHERE



Map
of the
EASTERN HEMISPHERE



CHAPTER III.

GENERAL DISTRIBUTION OF LAND AND WATER.—MOUNTAINS, VALLEYS, PLAINS.—TABLE OF HEIGHTS OF MOUNTAINS, ETC.

So high as heaved the hills, so low
Down sank a hollow bottom, broad and deep,
Capacious bed of waters. MILTON.

ON referring to the map of the world, we cannot fail to be struck with the unequal distribution of land and water on its surface, and with the large proportion covered by the waters of the ocean. The whole superficies of the globe (speaking in round numbers) is equal to 197,000,000 square miles nearly; of this the land does not occupy much more than 52,000,000 square miles, or little above one-fourth part: whilst the ocean covers an area of more than 144,000,000 square miles. We shall further observe that the proportion of dry land is much greater in the northern than in the southern hemisphere. The Antarctic regions are, however, too little known for any certain conclusion to be drawn respecting the relative proportions.

The sea occupies the cavities or depressions on the surface of the globe, separating and surrounding the more elevated portion of the earth's crust. The dry land may be arranged under two principal heads—continents and islands. The term continent has been applied to four portions of the earth, and it is common to speak of the continents of Europe, Asia, Africa, and America; but more correctly there are only two continents—two vast and detached portions of the globe—the Old World and the New World; nay, in fact, these are but larger islands, though, on account of their vast extent, and the different natural phenomena presented by continental and insular surfaces, it will be highly desirable to distinguish these divisions of the earth by the designation of continents.

The remaining portion of the dry land consists of islands of various dimensions, and of various elevation above the sea.

Australia so greatly exceeds in size all other islands, that it has been ranked as a continent, but is, perhaps, with greater propriety, included among the islands; it may, however, in conjunction with the numerous smaller islands with which the Pacific is studded, be regarded as a distinct division of the globe. This is sometimes distinguished by the appellation *Oceanica*.

The general disposition of the land will be observed to differ greatly in the Old and New Continents. In the Old World, especially in that portion which comprehends the divisions of Europe and Asia, the principal extension is from east to west; whilst in the New World it is from north to south. In both cases, this extension is in the direction of the principal mountain ranges. Thus, in the Old Continent, a continuous, or nearly continuous line of mountains, extends from the borders of Europe, on the Atlantic, to those of Asia, on the Pacific Ocean. In Africa, the mountain ranges are less known. The Atlas range, which stretches in the same direction as the great European and Asiatic line, is considered to form a portion of that mighty system. A chain of mountains is also supposed to extend from east to west across this vast peninsula at its greatest breadth, within a few degrees north of the Equator, whilst, to the south of that line, the mountain ranges appear to take a general direction from north to south in accordance with the form of Southern Africa.

This general correspondence between the form of the land and the direction of mountain ranges, is more strikingly exemplified in America, where the Rocky Mountains, and the elevated districts of Mexico, in the northern, and the stupendous Andes in the southern hemisphere, pursue, in a remarkable manner, the general direction of the New Continent. The same character is observable in smaller portions of land, and also in islands, the form of which usually coincides with that of their principal mountain ranges. This is well illustrated in the Dofraveldt Mountains in Scandinavia, in the Apennines in Italy, and in the islands of Japan, Sumatra, &c.

While considering the general configuration of the land,

we may further observe, that in those portions abutting on the great basin of the Atlantic, the proximate sides of the Old and New Continents appear as though they were, in some measure, mutually influenced by the forms of each other. Thus, the coast of Brazil, which forms the principal eastern projection of South America, is almost opposite to the vast African bight, or bay, which extends from Cape Palmas to Cape Negro; whilst the great western projection of Africa is counterbalanced by the basin of the Caribbean Sea and the Gulf of Mexico; and the south-western *trending*, or stretching out of the coasts of Europe, is answered by the receding of the opposite shores of North America.

The dry land is elevated into mountains and highlands, spread forth in plains, or depressed into valleys, all varying in extent and in elevation above the level of the sea; with one exception, however,—a large area occurring in Central Asia, including the Caspian Sea and the Lake of Aral, which is below the level of the ocean.*

The immense basin, which is occupied by the waters of the ocean, is apparently diversified in its surface like the dry land, the submarine valleys forming the deep and fathomless abysses of the sea, whilst the summits of the mountains constitute islands; the shores of the latter being more or less abrupt, according to the character of the oceanic mountains rising above the surface of the waters.

We have already seen that in all mountainous regions, whether of large or small dimensions, the direction of the axis, or principal range, usually accords with that of the greatest extension of land; the length of mountain ranges is therefore generally very great in proportion to their width. They often consist of one grand central range, from which branches or ridges of inferior elevation diverge at right angles; whilst from the latter, smaller lateral branches or spurs again extend, forming hills; and these usually gradually diminish in height until they are lost in the plains. Mountain ranges of considerable elevation are also occasionally met with, running parallel with each other, and

* Recent investigations have shown that the level of the Caspian Sea is 101 feet lower than that of the Euxine, or Black Sea.

inclosing between their ridges either elevated table-lands or deep valleys.

It rarely happens that both sides of mountain ranges present a similar character, one declivity being usually much steeper and more abrupt than the other, a circumstance which has considerable influence upon the temperature on the opposite sides of mountains. The declivities are generally steepest where great depressions occur, and accordingly, when mountains abut on the sea, we find their steepest slopes are most frequently presented to that side. Thus, the ridges of the Scandinavian mountains, and those of Greenland, both present their boldest escarpments to the North Atlantic Ocean. The lofty ridge of the Atlas gradually declines towards the Sàhra, or Great Desert, but is very abrupt on the northern side, where

Mauritania's giant shadows frown
From mountain cliff to coast descending sombre down.

The mighty range of the Andes has generally a gradual slope on its eastern declivity, but presents a series of rugged precipices to the Pacific, in some parts strikingly bold and abrupt.

Isolated or detached mountains are usually of volcanic origin. In some instances these attain a great elevation, of which Etna, Ararat, the Peak of Teneriffe, and Mowna Roa, form examples; but the loftiest summits generally form parts of extensive mountain ranges; and a reference to the table at the end of this chapter, will show that the most elevated mountains of Europe occur in the Alps, those of Asia in the Himalaya Mountains, and those of America in the Andes.

In describing mountain ranges, it is usual to adopt some terms which may be conveniently applied to distinguish the different portions of the system. The selection of these terms may be of little importance, but when our choice is made it will be highly desirable to adhere to those we have chosen. A *tree* will perhaps be found not ill adapted for this purpose. The *stem*, or *axis*,* will form an apt representative

* In botanical nomenclature, the stem is called the *axis*, or centre of a plant, because from thence the branches, leaves, &c., diverge in all directions.

of the grand central range of a mountain system ; the lateral *branches* of the plant will correspond with the inferior ridges, or mountain *branches*, which diverge at right angles from the central line, and which, like the branches of a tree, usually diminish in size as they recede from the central stem, or axis; whilst the *spurs*, or *small branches* will appropriately designate the small collateral *ridges* which diverge from the larger ridges.

Mountain ranges and hilly districts are intersected by *valleys*, the general arrangement of which corresponds with that of the mountainous or hilly ranges amongst which they are situated.

Valleys are distinguished according to their relative arrangement, into principal valleys, lateral valleys, and subordinate valleys. *Principal valleys* are such as separate extensive parallel ranges of mountains; of this description is the Valais, or Valley of the Rhone. *Lateral valleys* are valleys which intersect, and are formed by the lateral branches of a mountain range; and *subordinate valleys* are such as are formed by the spurs or minor branches, and are usually of inferior size. When valleys are narrow and difficult of access, they are termed ravines, dells, defiles, or passes. These narrow valleys are of most frequent occurrence among steep mountains, where the sides rise with precipitous abruptness, and often present scenes of much beauty and grandeur.

Some valleys consist of a series or continuation of basin-shaped cavities, successively rising in elevation, and separated from each other by a rocky barrier. In valleys of this description distinct ridges, apparently formed by deposits from water, frequently occur, marking the height at which the waters formerly stood. These ridges may often be traced at parallel heights on both sides of the valley, and, from the level road-like appearance they present, they have been termed *parallel roads*. They are of frequent occurrence in all mountainous districts, and are not uncommon in the Highlands of Scotland. Such are the parallel roads of Glen Roy, Glen Ghoy, and Glen Spean.

Some valleys are basin-shaped, or of a circular form, being surrounded on all sides by a girdle of mountains, with the ex-

ception of a narrow gorge, or outlet, through which the superabundant waters of the valley make their escape. Bohemia forms an example of such a valley, and consists of a single circular basin nearly 200 miles in diameter, and presenting the appearance of having been a vast lake, until a passage was forced through the Erzgebirge Mountain, and the gorge formed, through which the river Elbe at the present day flows into Saxony. Unless effected by slow degrees, and by the gradual wearing away of the mountain ridge, how fearful would be the devastating effects caused by the bursting of such a barrier, and the overflowing of such a lake !

Numerous instances also occur of mountain valleys still forming the beds of lakes ; in these cases the waters not having yet effected their escape. Lakes of this class are met with in the Alps, the Pyrenees, in the Himalaya Mountains, the Andes, &c.; and, though on a very small scale, in our own island : the tarn, or little lake, on the summit of Cader Idris, affording an example of such a mountain lake.

Plains of greater or less extent, presenting comparatively small inequalities, occur in all parts of the globe. A vast plain of this description occupies a considerable portion of Northern Europe, commencing on the German Ocean, and comprising the Netherlands, Denmark, the northern districts of France and Germany, a considerable portion of Poland, and nearly the whole of European Russia, and terminating only at the base of the Oural or Uralian Mountains. In the whole of this vast expanse the surface is in no part broken by hills of any elevation, except between Toropetz, Smolensk, and Moscow, where the low Valdai range (not exceeding 1200 feet in height) extends. This vast plain, or lowland, is separated by the Uralian range from another of yet greater extent, the Siberian lowland, which occupies nearly the whole of Northern Asia. Though many portions of these vast plains are covered with morasses, peat-bogs, and other tracts unfit for cultivation, much of the surface is fertile, yielding abundant crops of grain and other produce ; and a considerable portion is occupied by forests of birch and pine. The depression before alluded to, in the region of the Caspian Sea, may be considered as a continuation of the great European lowland.

A vast plain, or lowland, extends across the northern part of Africa, stretching from the shores of the Atlantic to the valley of the Nile, and being partially bounded on the north by the Atlas range, and terminated on the south by the elevated land which extends across from Cape Verde to Abyssinia. By far the greater portion of this tract, called the Sàhra, or Great Desert, consists of an enormous zone of sand, having a length of 2470 miles, and a breadth of 900. This

Wild expanse of lifeless sand and sky

is in some parts broken by low hills of sandstone, or by tracts of clay; and occasionally it is enlivened by verdant patches, called wadys or oases, appearing like islands in the desert, and varying in extent according to the supplies of water they obtain. The most considerable of these oases form the principalities of Fezzan and Darfûr; but the most celebrated, though less in extent, is that of Sivah, "the palms of which still wave over the ruins of the temple of Ammon, which indicate the ancient seat of African civilization."

In the New World, the great valley of the Mississippi presents a vast and magnificent plain. A large portion of this great lowland is remarkably level, and consequently subject to periodical inundations from the mighty rivers by which it is traversed. The more elevated parts consist of an alternation of forests and prairies, or savannahs, abounding in wild animals.

The lowlands of South America, called llanos, or silvas, and pampas, are of equal extent. They are naturally divided into three basins, the most northerly being that of the Oronooko, situated between the ridge of Caraccas and the highlands of Guiana, and extending westward to the base of the mountains of New Granada. The second great lowland, or the basin of the Marañon or Amazons, occupies the space between the mountains of Guiana and those of Brazil, stretching nearly across the continent to the foot of the mighty Andes. To the level plains in this part the name of llanos is more especially applied; they are of immense extent, and are covered with luxuriant herbage, the consequence of

the periodical inundations to which they are subject. The third lowland of South America forms the basin of Paraguay and La Plata. It includes the vast pampas, or unvaried plains of Buenos Ayres, which extend westward to the foot of the Andes, and southward to the cheerless wastes of Patagonia.

The plains to which we have hitherto directed our attention, are for the most part little elevated above the level of the sea; but there is another class of plains which claim some notice, and which are termed *plateaus*, or *table-lands*, an appellation which has been bestowed on account of their elevation above the other plains, and occasional table-like form, rising abruptly, with steep acclivities on every side. The name is, however, equally applied to any plains of considerable elevation above the sea, and they are not unfrequently met with among extensive mountain ranges, supported and bordered by the highest portion of the range, which again towers pre-eminently above them. Some of these table-lands are of great extent, and retain a general elevation of several thousand feet above the sea, though in many instances their surfaces are much undulated.

The most considerable table-land in Europe is that of central Spain, embracing the two Castiles, which has a general elevation of 2000 feet above the level of the sea.

Far as the eye discerns, withouten end
Spain's realms appear, whereon her shepherds tend
Flocks whose rich wealth right well the trader knows.

The descent from this table-land, or plateau, is on all sides very steep, and the transition from the almost treeless plains of Castile, to the milder climate and luxuriant vegetation of the lowland plains at the foot of the table-land, is very striking.

Asia, perhaps, presents some of the most extensive table-lands on the face of the globe. The most remarkable of these is the vast region of Central Asia, situated between the Altai Mountains and the Himalaya range, and which includes Tibet and the deserts of Cobi and Shamoo. This grand plateau is no less distinguished for its dimensions than for its altitude; the extensive plain forming the table-land of Tibet

having, according to the recent investigations of Dr. Hooker, an elevation of 15,000 feet above the level of the sea. In Persia we also meet with a table-land of considerable extent, the general elevation of which appears to be about 4000 or 5000 feet above the sea. The Dukhun, or Deccan, in Southern India, affords another instance of a table-land; the general elevation of this region is not, however, so great, usually not exceeding 3000 feet.

A table-land of considerable extent has been observed in Southern Africa. It is situated between the Orange river and the Kuisip, which flows into Walvisch Bay, and is flanked by the Unuma or Bulb Mountains. Its general elevation is from 2500 to 3000 feet above the sea level.

The New World affords examples of some very considerable plateaus. That of Mexico has a general elevation of 7000 feet above the sea; but its surface is varied by hills, and there are even plains of some size which are more than 1000 feet above the general level of the plateau. Of this the plain of Toluca forms an example.

Several less extensive but very elevated table-lands are included between the two lofty parallel ranges which constitute the Andes of Peru and Colombia. Such is the table-land of Quito, the general level of which is 8000 feet above the sea; and that of Riobamba, which is more than 10,000 feet above the level of the sea.

TABLE OF HEIGHTS OF MOUNTAINS, &c.

EUROPE.			Feet.
	Feet.	Oertler-spitz, ditto	12,850
Mont Blanc, Alps	15,750	Monte Viso, ditto	12,532
Monte Rosa, ditto	15,150	Mulhacén, Sierra Nevada,	
Monte Cervin, ditto	14,837	Spain	11,650
L'Alle Blanche, ditto	14,778	Simplon, or Monte Leone,	
Louclera, ditto	14,451	Alps	11,540
Louclon, ditto	14,144	Mont Cenís, ditto	11,466
Finister-aar-horn, ditto	14,100	Valeta, Sierra Nevada,	
Furca, ditto	14,000	Spain	11,398
Olan, ditto	13,878	Mont Perdu, Pyrenees	11,283
Jungfrau, ditto	13,700	Maladetta, ditto	11,120
Grand Glockner, ditto	13,700	Great St. Bernard, Alps.....	11,000
Pelvoux, ditto.....	13,442	Etna (Monte Gibello), Sicily,	
Shreckhorn, ditto	13,397	volcano	10,880

	Feet.		Feet.
Aiguille Noire, Alps	10,500	Brown Clee Hill, Shropshire	1,805
Argentaro, Balkan Moun- tains, Greece	10,000	Dundry Hill, Somersetshire	1,668
Pindus, Albania	9,750	Malvern Hills, Worcester- shire.....	1,414
Little St. Bernard, Alps ...	9,594	Wrekin, Shropshire	1,320
Corno, Apennines	9,520	Arthur's Seat, Mid-Lothian	810
Lomnitz, Carpathians	8,750	Dunnose, Isle of Wight.....	810
Velino, Naples	8,397	Beachy Head, Sussex.....	564
Schneehatten, Norway	8,120		
Parnassus, Greece	8,000		
Mount Pilate, Alps	7,000		
Snæfell, Iceland	6,800		
Olympus, Greece	6,500		
Mont d'Or, Auvergne.....	6,220		
Schneckopf, Riesenbirge, Silesia	5,270		
Hecla, Iceland, volcano	5,210		
Puy de Dôme, France	4,840		
Brocken, Hartz, Hanover ...	3,650		
Vesuvius, Italy, volcano ...	3,400		
Stromboli, volcano	3,000		
Gibraltar, Andalusia	1,429		
Valdai Hills, Novgorod, Russia	1,200		
Montmartre, Department of La Seine.....	400		
BRITISH ISLANDS.			
Ben Macdui, Aberdeenshire	4,418		
Ben Nevis, Inverness-shire	4,268		
Cairngorm, ditto.....	4,050		
Ben Lawers, Perthshire ...	3,944		
Ben More, Sutherlandshire	3,908		
Ben More, Perthshire	3,818		
Ben Glœ, ditto	3,724		
Ben Wyvis, Ross-shire	3,720		
Ben Ledi, Perthshire.....	3,651		
Schehallien, ditto	3,618		
Snowdon, Caernarvonshire	3,571		
Macgillicuddy's Reeks, Co. Kerry	3,410		
Ben Lomond, Stirlingshire	3,191		
Sleeabh Dorin, Derry	3,150		
Helvelyn, Cumberland	3,056		
Skiddaw, ditto	3,022		
Ben Venue, Perthshire	3,000		
Goat Fell, Isle of Arran ...	2,945		
Cader Idris, Merionethshire	2,914		
Cheviot, Northumberland ...	2,628		
Plinlimmon, Cardiganshire	2,463		
Ingleborough, Yorkshire ...	2,361		
Snæfell, Isle of Man	2,004		
Holmeness, Derbyshire	1,859		
		ASIA.	
		Dhawala-giri, Himalaya, about	28,800
		Kinchin-jinga, ditto	28,174
		Jewahir, ditto.....	25,750
		Jamautri, ditto	25,500
		Chamalari, ditto	23,900
		Donkiah, ditto	23,000
		Purgkeecool, Chinese Tartary, twin peaks	22,400
		Elburz, Caucasus	18,403
		Koh i Baba, Hindoo Koosh	18,000
		Ararat, or Agri-dagh, Arme- nia	17,262
		Klutchefskaia, Kamtchatka, volcano,	15,823
		Kazbec, Chinese Tartary ...	15,345
		Petchan, ditto, volcano	15,000
		Demavend, Elburz range, Mazanderan	14,700
		Argæus, or Arjish-dagh, Tau- rus range, Asia Minor.....	13,100
		Sevellan, Azerbaijan	13,000
		Sochonda, Chinese Tartary	12,800
		Indrapura, Sumatra	12,800
		Gunong Dempu, ditto, vol.	12,000
		Koriatskaia, Kamtchatka, volcano	11,215
		Bieluka, Altai.....	11,000
		Supan-dagh, Armenia	11,000
		Krionotskaia, Kamtchatka, volcano	10,625
		Shivelush, ditto, ditto.....	10,591
		Hermon, or Jesh Sheikl, Syria	10,000
		Lebanon, do.	9,520
		Sinai, Arabia Petrea.....	9,300
		Dodabetta, Neilgherries, India	8,760
		Adam's Peak, Ceylon	8,280
		Me-lin, China	8,200
		Olympus, Asia Minor.....	6,500
		Bettigo, Western Ghats, India	6,500

	Feet.
Mount Casius, Syria	5,318
Papandayang, Java, volcano	5,000
Ida, Asia Minor	4,960
Plain of Ispahan, Irak, Persia	4,140
Cheizgour, Vindhya Moun- tains, India	2,400
Mount Carmel, Palestine ...	2,160
Mount Tabor, ditto	1,950

AFRICA.

Kilmand-jaro, Zanguebar ...	20,000
Geesh, Abyssinia	15,000
Camaroons, Biafra	13,000
Peak, Teneriffe	12,300
Lamalmon, Samen Moun- tains, Abyssinia	11,400
Miltzen, Atlas	11,200
Clarence Peak, Island of Fernando Po	10,600
Nieuveltdt, Beaufort, Cape of Good Hope	10,000
Compass-berg, Graffreynt, ditto	10,000
Gros Morne, Isle de Bourbon	9,600
Peak, Fuego or Fogo, Cape Verde Islands, volcano ...	7,800
Volcano, Isle de Bourbon ...	7,600
Trigo, Canaries	7,400
Peak, Azores	6,900
Peak, Tristan d'Acunha ...	6,400
Ruivo, Madeira	6,000
Khamies, Cape of Good Hope	5,300
Table Mountain, ditto	3,380
Kong Mountains, Western Africa	3,000
Green Mountain, Island of Ascension	2,868
Diana's Peak, St. Helena ...	2,692
Lion's Head, Cape of Good Hope	2,166
Cape of Good Hope	1,000

NORTH AMERICA.

Mount St. Elias, volcano ...	17,860
Popocatepetl, Mexico, ditto	17,716
Orizaba, ditto, ditto	17,374
Nevada de Mexico	15,700
Mount Fairweather	14,732
Mount Hood	14,000
Water Volcano, Central America	12,600

	Feet.
Long's Peak, or Bighorn, Rocky Mountains	12,500
James's Peak, ditto	12,000
Pike's Peak, ditto	11,500
Sierra de Colmbre, Cuba ...	9,000
Serrana Grande, Haiti	8,970
Blue Mountains, Jamaica...	7,486
Mount Washington, White Mountains, U. S.	6,650
Black Mountains, Alle- ghanies	6,476
Mount Werner, Greenland	6,000
Morne Garou, St. Vincents, volcano	5,100
Souffriere, Guadaloupe, ditto	5,040
Jorullo, Mexico, ditto	4,267
Katskill, New York	3,454
Apalachian Peak	2,700

SOUTH AMERICA.

Aconcagua, Andes, volcano	23,907
Sabama, ditto	22,350
Chimborazo, ditto	21,415
Nevada de Serata, ditto ...	21,236
Illimani, ditto	21,145
Cayambe, ditto, volcano ...	19,625
Antisana, ditto, ditto	19,137
Catopaxi, ditto, ditto	18,858
Arequiga, ditto, ditto	18,373
Pic de Tolima, ditto	18,314
Nevada de Merida, Colombia	16,420
Cerro de Potosi, Andes	16,000
Pichincha, ditto, volcano ...	15,940
Tunguragua, ditto, ditto ...	14,974
Silla de Caraccas, Colombia	8,630
Duida, ditto, volcano	8,278
Roraima, Guiana	7,450
Itambe, Brazil	5,960
Cape Horn	1,860

OCEANICA.

Mowna Koah, Hawaii	16,000
Mowna Roa, ditto, volcano...	16,000
Erebus, South Victoria Land, ditto	12,400
Peak, Balleny Isles, South Sea	12,000
Peak, Tahiti	10,900
Sea View Hill, Australia ...	6,500
Mount William, ditto	4,500
Ben Lomond, Tasmania ...	4,200
Kiraueh, Hawaii, volcano ...	3,870
Bathurst Height, Australia	2,000

	Feet.		Feet.
Manasarooa (Manasarowara)		City of Riobamba, South	
Lake, Tibet	14,500	America	10,800
Lake of Puno or Titicaca ...	12,796	City of Quito, ditto	9,356
Lake Lucerne, Switzerland ...	6,220	City of Toluca, Mexico	8,818
Lake of Lucerne, ditto	1,380	City of Mexico	7,470
Lake of Geneva, ditto	1,207	Hospice of St. Gothard, Alps	6,900
Lake Superior, North		St. Veran, Cottian Alps, the	
America	641	most elevated village in	
Lake Erie, ditto	560	Europe	6,693
Lake Ontario, ditto	230	City of Madrid	2,173
		Leadhills House, Lanark-	
		shire, the highest inhabited	
		spot in Britain	1,280
Village of Daba, Tibet	14,500	Great Pyramid of Egypt ...	720
Shepherds' Huts on Antisana,		Dover Castle, Kent	469
Andes	13,435	City of Edinburgh	443
Town of Potosi, South		City of London (St. Paul's	
America	13,350	Cathedral)	400
Milum Temple, near the		Greenwich Observatory,	
source of the Ganges	13,000	Kent	214
Highest ascent in a balloon (MM. Biot and Gay Lussac, at Paris,			
in 1804)			22,900
Elevation attained by MM. de Humboldt and Bonpland, on			
Chimborazo, in 1803			19,332
Elevation attained by M. Boussingault and Col. Hall, on			
Chimborazo, in 1831, the greatest terrestrial height			
hitherto accomplished			19,699
Highest flight of the Condor			21,000

CHAPTER IV.

DISTRIBUTION OF THE WATERS OF THE GLOBE,—OCEAN,
—INLAND SEAS.—LAKES.—RIVERS.—SPRINGS.

Turn to the watery world.—CRABBE.

ALTHOUGH, for the convenience of description, the ocean has received several nominal subdivisions, yet, correctly speaking, the different seas and oceans are but parts of one mighty whole, one "capacious bed of waters."

O, thou vast ocean! ever sounding sea!
 Thou symbol of a dread immensity!
 Thy voice is like the thunder; and thy sleep
 Is as a giant's; slumber loud and deep,—
 Thou speakest in the east and west
 At once.

The two principal divisions of the ocean, the Atlantic and the Pacific, are formed by the extension from north to south of the two great continents. The Austral, or Southern Ocean, may be considered as forming a third division, and occupies that portion of the ocean not included in the two former. Its limits may be marked by a line passing round the globe, and touching the Cape of Good Hope, Cape Horn, and the southern extremity of Tasmania, or Van Diemen's Land.

The Atlantic Ocean is sometimes subdivided into three portions—the Northern Ocean, the North Atlantic, and the South Atlantic. The imaginary separation between the Northern Ocean and the North Atlantic, is marked by a line drawn across the ocean, from the southern extremity of the British Isles to the southern extremity of Greenland. The North Atlantic extends from thence to the equator; and the South Atlantic from the equator to the southern extremities of Africa and America.

The Pacific Ocean has also three nominal subdivisions,—the North and South Pacific, and the Indian Ocean. The North Pacific extends from Behring's Straits to the equator; and the South Pacific from thence to Cape Horn and the southern side of Australia. The Indian Ocean comprehends the seas between Australia and the Malayan Islands, and the eastern coast of Africa. Its separation from the Austral, or Southern Ocean, is merely nominal.

With these oceans, various seas communicate, either by narrow straits, as the Mediterranean, the Red Sea, and the Baltic; or by wider channels, as the White Sea, the Yellow Sea, Baffin's Bay, &c.

Besides these seas, all of which have an outlet into the main ocean, and most of which penetrate to a considerable extent into the land, we meet with other seas which are wholly Inland. Such are the Sea of Aral, and the Caspian Sea. These, however, though denominated seas, have many of the characteristics of lakes; and perhaps it would not be easy to define the difference between an inland sea and a lake. If size be considered to form the distinction, the lakes of North America will doubtless be entitled to rank as seas; if saltness, the lakes of Van, in Armenia, and of Ourmia, in

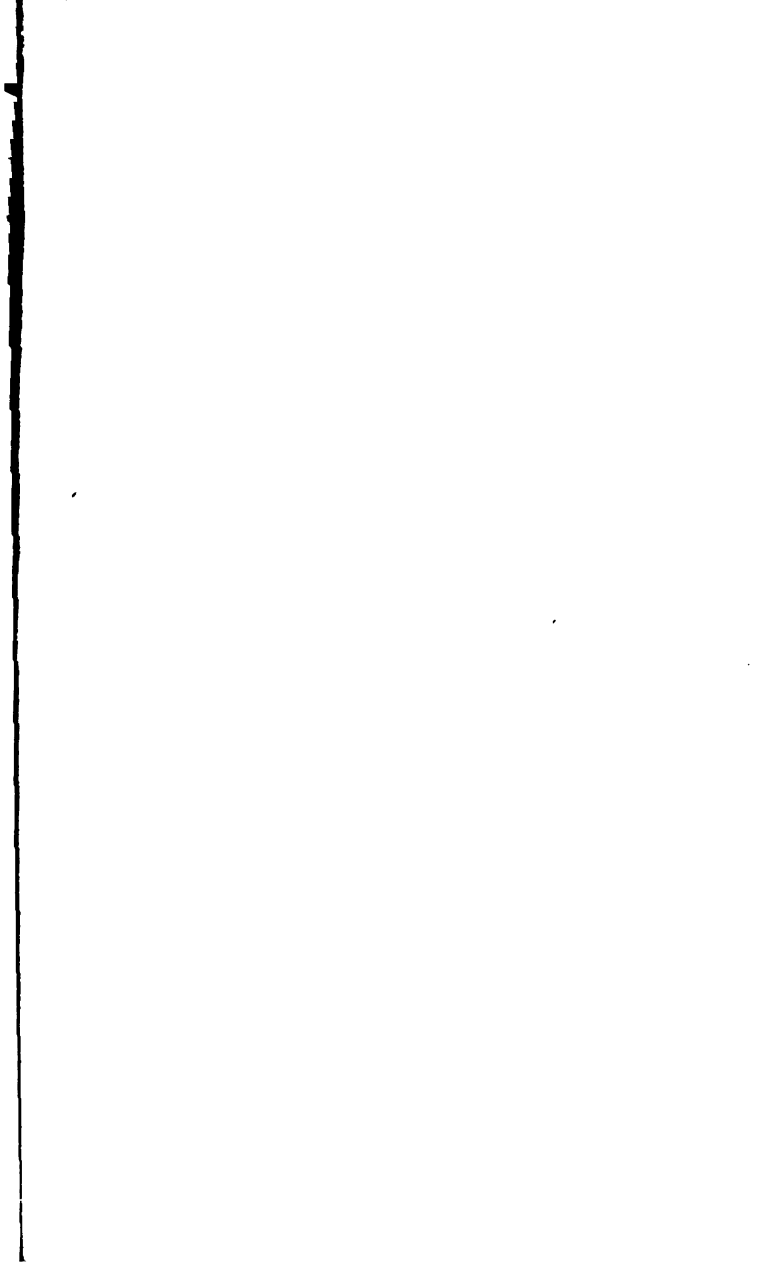
Persia, with many others of smaller size, are entitled to this distinction.

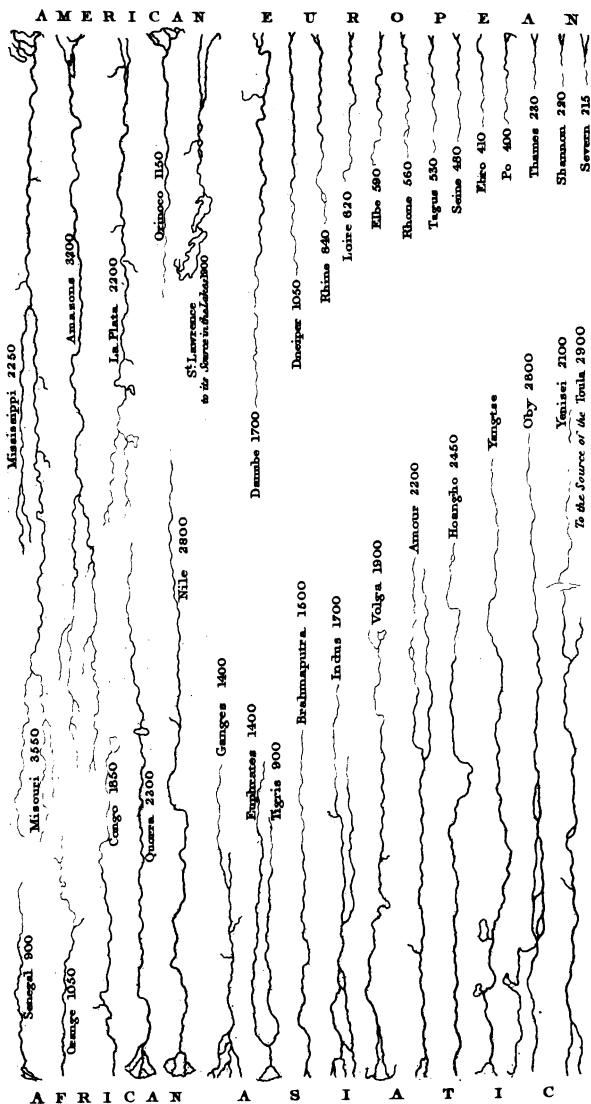
The most celebrated European lakes are those of Constance and Geneva. The Russian lakes, of which Ladoga is the largest, are, however, of much greater extent. The British lakes, though presenting much picturesque scenery, are of small size; the largest English lakes, those of Westmoreland and Cumberland, would appear as mere specks on the map of Europe. The lakes of Scotland, of which Loch Lomond is the largest, though of somewhat greater extent, are insignificant in a general view of the world. The lakes of Ireland are likewise of small dimensions; but the Lake of Killarney and Lough Erne are celebrated for their beautiful and picturesque scenery.

Asia contains some lakes of considerable size, among which the most remarkable are Lake Baikal and the lakes of Tibet. The greater number of the Asiatic lakes are salt, their waters in some instances being more saline than those of the ocean; the most celebrated of the latter is Lake Asphaltites, or the Dead Sea. Many of these natural depositories of salt are situated in the interior of this vast region, and their occurrence in districts so far removed from the sea, is of great importance to the inhabitants, who, in many cases, obtain considerable supplies of that valuable article, merely by collecting the saline incrustations formed round the margin of the lakes.

We are too little acquainted with the interior of Africa to speak with any certainty as to the number or character of its lakes: but a lake of considerable size called Lake Ngami, or Makkoré, has been recently discovered in Southern Africa, and Lake Tchad in Bornou is described as one of the largest fresh-water lakes in the world.

North America, however, may be considered as the country of lakes. A vast chain, more or less connected with each other, extends across a large portion of the continent, commencing near the shores of the Arctic Ocean, and terminating on those of the Atlantic. Many of these lakes are of great extent, but the most remarkable are those which form the great water system of Canada. The largest of these is





Published by J. W. Parker, West Strand.

Lake Superior, which has an extreme length of 380 miles, and a breadth of 161 miles. The surface occupied by the Lakes Superior, Michigan, and Huron, is computed at 72,930 square miles.

South America is very deficient in lakes; that of Titicaca being the only considerable one in this portion of the New World. This lake, however, is remarkable on account of its great elevation above the level of the sea.

The size and course of *rivers* are mainly determined by the height and direction of the mountain ranges, or hilly districts, in which they take their rise; and also by the extent of surface between their sources and the sea. A reference to Plate III. will show that the longest known rivers in the world are those of North and South America.

The largest rivers of Europe, the Rhine, the Rhone, and the Danube, take their rise in the Alps. When mountain ranges form the separation between two countries, the boundary is not unfrequently marked by the course the rivers take, which is called the *water-shed*. Thus, in the Pyrenees, the direction of the streams flowing either north or south, is considered as indicating the limits of France and Spain.

The majestic rivers of Asia, the Ganges, the Indus or Scind, the Irawaddy, and the Brahmapootra, have their sources in the Himalayan range. The rivers of China, also, take their rise in the continuation of the same vast line of mountains. The northern rivers of Asia, the Irtysh, the Obi, and the Yenesei, all originate in the Altai mountains.

In Africa, the Nile has one of its sources among the lofty mountains of Abyssinia, and the other in the more distant central range. Respecting the sources of the other principal rivers of Africa, there is still much obscurity, but the grand central range, which apparently stretches across from east to west at no great distance to the north of the Equator, bearing in its eastern portion the name of the Mountains of the Moon, and in its western extension that of the Kong mountains, is considered to form the principal water-shed in that portion of Africa; and a range of snow-capped mountains, situated to the north of Lake Ngami, called also the Moun-

tains of the Moon,* appears to constitute the chief source of the rivers of that region.

In North America, the Arkansas, the Red River, and the Missouri, all tributaries of the Mississippi, take their rise in the Rocky Mountains. In the same great range, we also meet, in close connexion, the sources of the river Columbia, and of the Saskatchewan; the former of which, taking a westerly course, falls into the Pacific; whilst the latter, flowing in an opposite or easterly direction, enters Lake Winnipeg, and passing through the vast chain of lakes, of which the St. Lawrence forms the outlet, finally falls into the Atlantic Ocean.

In South America, the majestic Marañon, or river of the Amazons, the Orinoko, the Magdalena, and other vast rivers, spring from the mighty range of the Andes. The Parana and Paraguay take their rise in a range of less elevation, which stretches across the continent to the coast of Brazil.

When the sources of rivers lie among mountains, they are subject to sudden descents, which give rise to rapids, cascades, and cataracts. Rapids are caused by the greater slope or inclination of the bed of the river, which causes the water to rush down in that particular part, sometimes with fearful velocity. Cascades and cataracts are formed by the water precipitating itself from a ledge or mass of rock, with a perpendicular, or nearly perpendicular descent. When in their most impetuous character, they are denominated cataracts; when more gentle, they are termed cascades.

Although England may not boast of any waterfalls that can vie with those of countries of more mountainous character, it nevertheless possesses some cascades of considerable beauty. Cumberland, Westmoreland, Durham, Yorkshire, and Devonshire, present many instances of picturesque waterfalls. One of the most beautiful in this country is the fall of the Tees, in Durham.

* These southern mountains were known to the early Portuguese navigators under this name; and it appears that some modern geographers have fallen into error by confounding these with the far more northerly Mountains of the Moon.



Fall of the Tees.

The river, obstructed and divided by a mass of rock, descends in a double cataract from the top; but reuniting its waters before they reach the bottom, the whole dashes into the basin with a force and grandeur scarcely inferior to the cataracts of Switzerland, or even America.

The falls of the Cayne and the Mawddach in Merionethshire, called Pistil-y-Cayne and Pistil-y-Mawddach, are highly picturesque. The former is described as particularly magnificent. Scotland presents us with some very grand waterfalls. The most stupendous is that of Glomach, in the county of Ross. In Ireland we meet with the fall of Powerscourt, in the county of Wicklow, which is remarkable for the beauty of the surrounding scenery.

Amongst the most celebrated waterfalls of Europe are the cataracts of the Dahl, in Sweden; of the Rhine, near Schaffhausen; of the Staubbach, in Switzerland; of Tivoli, and Terni, in Italy; and of Ceresoli, in Savoy. The latter is said to have a fall, not unbroken, however; of 2400 feet.

The most remarkable known waterfalls of Asia are situated among the Himalayan mountains. A cataract of the Shirawati, in the Indian province of Canara, is described as being of surpassing beauty and sublimity, and as having a fall of 1150 feet.

We have remarked that North America has been called the country of lakes; it may certainly with equal propriety be termed the region of waterfalls. Besides a very large number of rapids and minor falls, it contains an unusual number of principal cataracts. This is in great measure owing to the geological character of the country, to which we shall, in a future page, direct our attention. These falls are, however, generally more remarkable for the vast body of water they pour down, than for the depth of the falls. The stupendous Fall of Niagara is formed by a large and rapid river, 1650 feet in width, which precipitates itself by two channels in one leap, 160 feet perpendicular.

Smooth to the shelving brink a copious flood
Rolls fair and placid; where collected all
In an impetuous torrent, down the steep
It thundering shoots, and shakes the country round;
At first an azure sheet, it rushes broad,
Then whitening by degrees, as prone it falls,
And from the long-resounding rocks below
Dashed in a cloud of foam, it sends aloft
A hoary mist, and forms a ceaseless shower.

South America contains several waterfalls; the most celebrated of these is the cataract of Tequendama, near Bogota, situated amongst some of the most picturesque scenery of the Andes, and which has a fall of 540 feet; and, perhaps, one of the most remarkable is that situated among the Pacaraima mountains, in British Guiana, where, according to Sir R. Schomburgk, the river Kamaiba precipitates itself in a cascade of nearly 1500 feet.

Rivers are fed either by springs or by the melting of the snows. They do not, therefore, receive their largest supplies from the actual summits of mountains, for large springs are not of ordinary occurrence near the summits of the mountains; nor are the vast accumulations of ice and snow, called glaciers, met with on the highest points, or peaks of moun-

tains, but usually on the declivities, or slopes of the upper mountain valleys.

Springs derive their supplies from water, raised into the atmosphere by evaporation, and again deposited on the earth in the form of showers, or mist. This moisture, entering the ground by means of fissures in rocks, or through porous beds, continues to sink, until arrested in its progress by rocks impermeable to water, when it gushes forth as a spring, larger or smaller, according to the supplies it has received. Mountains and hills arrest and condense clouds, and consequently a greater deposition of moisture takes place in mountainous districts; but it will be evident that a peak, or pointed summit, on account of the small surface it presents for collecting the waters from above, will not be favourable to the formation of copious springs.

The largest spring in Great Britain is that of St. Winifred's Well at Holywell, which is said to throw up about twenty-one tuns of water per minute, or 30,240 tuns daily.

All springs contain some solid matter, either saline or mineral; when this is in excess, they are called mineral springs. Such are the waters of Tunbridge, Cheltenham, and Harrowgate.

Thermal, or hot springs, occur in almost every region of the globe. Some are of very high temperature; the hottest in this country are those of Bath, which have a temperature of 116° . The Carlsbad springs, in Bohemia, have a temperature of 167° ; and those of Coquinas, in Sardinia, a temperature of 198° . The boiling springs of Iceland are well known; and the magnificent jets or fountains of boiling water periodically thrown up by the Geysers, entitle them to be ranked among some of the most extraordinary phenomena of the natural world. The Great Geyser shoots up vast columns of boiling water to the height of ninety or one hundred feet, which succeed each other with great rapidity, after which a pause ensues. There are generally four great series of such eruptions in the course of twenty-four hours, but the intermissions of this extraordinary fountain are not absolutely regular.

CHAPTER V.

THE ATMOSPHERE; ITS CONSTITUTION, AND WEIGHT, OR
 DENSITY. — EVAPORATION. — DEW. — MISTS. — CLOUDS.
 — RAIN. — WINDS.

. God made
 The firmament, expanse of liquid, pure,
 Transparent, elemental air, diffused
 In circuit to the uttermost extent
 Of this great round. MILTON.

THE earth is surrounded by an invisible and highly elastic fluid, termed its *atmosphere*, which may be considered as a body, accompanying and revolving with the earth. The extent of the atmosphere is supposed to be about forty or fifty miles.

Atmospheric air was long considered to be an “elemental” or simple body, but it is now well known to consist of a mixture of oxygen and nitrogen gases, in regular proportions, usually estimated at twenty-one parts of oxygen to seventy-nine of nitrogen. The atmosphere also always contains a small proportion of carbonic acid, the quantity of which is subject to slight variations. It likewise holds water suspended, in the state of vapour, the proportions of which are still more fluctuating.

Air is ponderable, or has weight; its weight, however, differs according to its temperature. At the temperature of 60° Fahrenheit, 100 cubic inches of air weigh 30½ grains troy; and a perpendicular column of the whole atmosphere weighs about 14½ pounds. This is just balanced by a mercurial column of about 30 inches in height; and it is on this principle that the mercurial barometer is constructed.

The weight or density of atmospheric air is not uniform throughout its whole extent; a gradual diminution taking place as we ascend above the level of the sea. The rate of decreasing density is such, that at the height of seven miles, the atmosphere would have a density equal to only one-fourth

of that at the surface of the sea ; and at the height of fourteen miles, it would have only one-sixteenth. These heights have never been attained by man, but the ratio is the same at smaller elevations, and the consequence is, that on ascending elevated ground, the atmosphere exerts less pressure on any substance on which it rests.

The average pressure of the atmosphere (though subject to temporary alterations from meteorological causes) is found to be the same, or very nearly so, at any one place from year to year ; and over the whole globe its lines of equal density, or pressure, are parallel to the sea level. If, therefore, we know the mean density at any one station, for instance, 2000 feet above the sea, we may conclude that any other place having the same density, has a similar elevation above the sea. This decreasing density is indicated by the barometer, the mercury in the tube falling at greater elevations. Thus, at the level of the sea, near the foot of Chimborazo, M. de Humboldt found that the barometer stood at exactly thirty inches ; whilst at the elevation of 19,332 feet, to which he ascended on that mountain, it was no higher than fourteen inches and eight lines. And in December, 1831, when M. Boussingault, accompanied by Colonel Hall, ascended the same mountain, to the elevation of 19,699 feet, the barometer fell to thirteen inches, eight lines. At all other places having the same elevation above the sea (allowing for some variation of temperature), the indication of the barometer would be similar ; and thus, by the use of that instrument, we are enabled to obtain a very near approximation to the heights of all places which are accessible to the foot of man.

The mean height of the barometer in London is twenty-nine inches and nine lines, nearly. The height of the mercurial column varies in this climate, from about twenty-eight to thirty-one inches.

Another mode of measuring heights, dependent also on the density or pressure of the atmosphere, is by the *boiling point of water*. In London, and at all other places having a similar elevation, water boils at 212° Fahrenheit ; and we are so accustomed to associate the notion of its ebullition or boiling up, with that particular temperature, that perhaps at first we

may find some difficulty in reconciling the idea of "boiling water" with any other degree of heat. This ebullition, or boiling up of water is, however, dependent on the pressure of the air above it; and the boiling point of water decreases in a ratio nearly equivalent to the decrease of atmospheric density. And accordingly, at considerable elevations above the sea level, water, when boiled, does not acquire so high a temperature as 212° , and, under ordinary circumstances, cannot be raised to that temperature. At great elevations, it is, therefore not so available for some culinary purposes; and we much doubt (allowing all other conditions to be similar) whether so good a cup of tea could have been made at the Hôspice de St. Bernard, 8,600 feet above the level of the sea, as in the metropolis of England; at the former place the temperature of boiling water being only 203° ; and still less could this be accomplished at the Cerro de Pasco, in Bolivia, (celebrated for its silver mines,) the height of which is 13,673 feet above the sea, and where the boiling point does not exceed 189° . The boiling point of water forms, however, a highly useful standard for measuring the altitude of any accessible locality.

Although a certain proportion of water, or aqueous vapour, is always present in the atmosphere, the quantity is liable to considerable variations, this being in great measure dependent on the temperature of the air. If water be exposed to the air, it gradually disappears, finding its way into the atmosphere by the process called evaporation. Warm air, however, is capable of taking up, and holding in suspension in the state of invisible vapour, more water than cold air. Thus, a cubic foot of air, at the temperature of 32° , the freezing point, has not capacity for holding more than two grains and about a third; whilst, at the temperature of 60° , it will hold about five grains and three quarters; and at that of 70° , nearly eight grains. This, it will readily be perceived, accounts for the greater rapidity with which a lake, or pond, or any other surface of water, is dried up, or carried off in the form of invisible vapour, in warm than in cold weather. This, also, in great measure, accounts for the phenomena attending the formation of dew.

One of the conditions essential to the deposition of *dew*, is, that the atmosphere must contain an excess of moisture; that is, more than it has capacity to hold. When the air becomes heated during the day, and raised to a high temperature, its capacity for holding moisture is increased, and, under ordinary circumstances, by the means of evaporation, it will become charged with moisture. If, then, it hold in suspension aqueous vapour proportioned to its capacity, it will, when the temperature decreases towards night, contain an excess of moisture, or more than it has capacity for holding suspended at that lower temperature; and the superabundant moisture will accordingly, as the temperature of the air gradually diminishes, be gradually and gently deposited in the form of dew. The deposition will be greatest when a clear cool evening succeeds a sultry day. In our climate, the difference of temperature between day and night is usually greatest in spring and autumn; and consequently, the dews are generally most abundant at those seasons.

In calm weather, and under ordinary circumstances, the moisture evaporated from a given tract of land, might be supposed to be deposited on the same tract at night. But even with a gentle breeze, this portion of air may be removed to a considerable distance before night-fall. If, however, the wind should pass over a similarly-constituted district, it may carry with it a similar supply of moisture; but should it cross an arid sandy tract, the air will not be replete with aqueous vapour, and little or no deposition of dew will take place. If, on the other hand, the wind should pass over water, or a swampy surface, the deposition of dew may be increased. The difference in the quantity of dew deposited, according to local variations of the surface, is displayed to a certain extent in our own island. It may be familiar to our readers, that dews are usually less copious during the prevalence of easterly than of westerly winds; a circumstance attributable to the different nature of the surface over which these winds pass; the easterly crossing the continent of Europe, whilst the westerly sweep across the wide Atlantic Ocean. This phenomenon is, however, more strikingly exhibited in hot climates, where winds which pass over an expanse of water, usually become loaded

with moisture, and a very copious deposition of dew takes place. Thus, in Egypt, the north wind, which crosses the Mediterranean, deposits dew in such abundance, that it is sufficient to soak through the garments of the inhabitants; whilst, during the prevalence of the south wind, which traverses extensive tracts of sandy deserts, no dew is deposited.

A serene and cloudless sky is very favourable to the deposition of dew, little or no dew being formed if the sky be veiled in clouds,—a circumstance which has probably not escaped the notice of our readers, and which is, in some measure, attributable to the comparatively higher temperature; which usually prevails at nights when the sky is clouded than when it is clear; and it not unfrequently happens that on nights when the sky is alternately clear and enveloped in clouds, dew will appear and disappear with the changing atmosphere.

It is also essential for the copious deposition of dew, that the ground, or any surface on which it forms, should possess a temperature considerably below that of the atmosphere. The air in contact with the cold body becomes chilled, and thus losing its capacity or power of holding so much invisible vapour, the latter is condensed and deposited in the form of dew. This effect may be observed when a glass of cold water is taken into a warm room in summer. The invisible vapour contained in the air of the apartment is condensed, and fixed on the exterior of the glass. It is also exemplified by the steam, as it is commonly called, or dew, frequently observable on the glass windows of an apartment. When the external air is considerably colder than that of the room, the glass acquires a corresponding low temperature, and the invisible vapour in the air of the apartment becomes condensed on the panes. The deposition will, of course, be greater or less, according to the heat and moisture of the apartment, and the cold of the external air; and if our apartments are kept warm, it is therefore generally more abundant in winter than in summer; and very copious deposits will be observed on the lights of hot-houses and conservatories.

For the rapid formation of dew, it is essential that the surface of a body should be ten or fifteen degrees cooler

than the air. All substances are not, however, equally subject to be covered with dew; and the consequences to which this leads in the natural world are of the most interesting character. In clear weather, a thermometer laid on grass has been known to mark twelve degrees lower than one laid on garden mould, and sixteen and a half degrees lower than one laid on a gravel-walk. It will be evident that a much more abundant deposition of dew will take place on the grass than on the other portions of the surface: and thus we find that the dew is most copiously deposited on the herbs of the field, which need this nourishment; whilst land, uncovered by vegetation, and more especially stony ground, which does not require and would not benefit by it, receives a comparatively small supply. Such is the economy of nature, and thus admirably has its All-wise Author adapted these, as well as numberless other means, so as to effect the utmost possible benefit to His creatures; often, however, performing their part so silently, and almost imperceptibly, that the closest investigation is required to discern their beauty and excellence.

. But what is all creation less
Than a capacious reservoir of means
Formed for his use, and ready at His will?

Mists, or fogs, are formed by the condensation of invisible vapour into minute drops of water, near the surface of the earth, and may be considered as dew, which, owing to accidental causes, remains suspended above the land or water, instead of descending in the form of dew. Mists, or fogs, are liable to be formed under circumstances unfavourable to the deposition of dew, namely, when the lower stratum of the air is cooler than the surface of the ground or water over which they rest. They are, therefore, more frequent in autumn, and at the approach of cold weather, than in spring; and as the temperature of the sea is often higher than that of the atmosphere, they are by no means uncommon on the ocean, more particularly in cold climates, and are very frequent in the polar regions. A remarkable stationary fog occurs off the coast of Newfoundland, which owes its origin to the chilly atmosphere of that station, and the comparative

warmth of the waters of the adjacent ocean, the temperature of which appears to be raised and maintained by the remarkable current called the Gulf Stream.

The formation of *clouds* is also effected by the condensation of vapour. Vapour is always invisible; clouds therefore are not vapour, but water. When vapour is cooled below its constituent temperature, it becomes visible, forming itself into a fine watery powder, the size of the particles of which it is composed being extremely minute. These particles, estimated by some authors as being one twenty-thousandth of an inch in diameter, and by others as not exceeding one hundred-thousandth of an inch, would descend very slowly, and clouds formed of an accumulation of these minute particles would be readily carried by the wind. When, however, they unite into drops, they become heavier, and fall to the earth in the form of rain; the size of rain-drops being considered to vary from one twenty-fifth of an inch to one-third of an inch. When drops are formed at a considerable height in the atmosphere, or in very cold strata of air, they descend in the form of hail or snow. If the congelation of moisture takes place slowly, snow is formed; whilst hail appears to be produced suddenly, by intense cold in the upper regions of the atmosphere; the latter, therefore, frequently occurs in summer, and in hot climates, where snow is unknown.

The quantity of rain which falls in different parts of the earth is very variable; it, however, appears that the mean annual quantity is greatest in tropical climates, and diminishes as we recede from the equator. Thus, the mean annual rain at

		INCHES.
Island of Granada, lat. 12°, is equal to	126	
Calcutta . . . lat. 22° 23'	„	81
Rome . . . lat. 41° 54'	„	39
Edinburgh . . lat. 55° 57'	„	24
Petersburgh . . lat. 59° 56'	„	16

But although this gradual diminution may be considered as a general rule, the quantity of rain is by no means solely dependent on latitude, but is liable to vary according to local variations of the surface, being much influenced by elevated land,

and also by trees, both of which attract moisture; and, consequently, elevated and well-wooded districts are subject to more rain than flat or barren countries. Much also depends on the prevailing winds; if these pass over the ocean, they bring a considerable portion of vapour, and if the shores present an elevated surface, or are covered with forests, the vapour becomes condensed, and the moisture is deposited in the form of rain. In such cases, it not unfrequently happens that the air loses so much of its moisture, that a considerable difference occurs between the quantity of rain that falls near the coast and further in the interior. In Great Britain, the winds sweeping over the expanse of the Atlantic Ocean, deposit more rain in the western than in the eastern districts. Thus, as we have seen, the mean annual quantity of rain at Edinburgh is 24 inches, whilst in the neighbourhood of Glasgow it is 32 inches, and in some parts of Ayrshire amounts to 52 inches. A very striking instance of the arresting and condensing effects of trees and elevated land is met with in Patagonia. On the western side of the Patagonian Andes, only a narrow slip of land, in most parts covered with the richest vegetation, lies between those mountains and the Pacific; the westerly winds, sweeping across the Pacific Ocean, arrive charged with vapour, which, owing to the wooded and hilly character of the district, becomes immediately condensed and deposited, in the form of abundant and almost incessant rain. The cold of the mountain ridge which separates this district from the plains of Eastern Patagonia, again still further arrests and condenses the vapour contained in the atmosphere, causing the whole superabundant moisture to be deposited on the summit; and thus, when the westerly winds prevail, no rain whatever falls on the eastern side of the mountain ridge, and the Patagonian plains being in consequence nearly destitute of moisture, present a singularly dreary and desolate aspect. In the northern parts of Chili and in Peru, on the other hand, the country between the Andes and the Pacific being flat and nearly destitute of trees, the moisture brought by the westerly winds is not attracted or condensed until it reaches the mountain ridge, the result of which is, that although an abundant deposition

takes place on the mountains, giving rise to the most magnificent river system in the world, rain is unknown in Peru.

The general dampness of any climate does not, however, necessarily depend on the mean quantity of rain which falls in the course of a year, for a country may be involved in almost perpetual mists or drizzling rains, although the number of inches of rain during that period may not be great; and, indeed, generally speaking, the number of rainy days is least, where the annual fall of rain is greatest, the rains occurring periodically in extreme abundance, six inches, or more, sometimes falling in twelve hours. In some parts of the earth, however, extensive tracts exist, where rain is never known to fall, or if at all, only at intervals of many years, and then usually in small quantities. Such is the case with some parts of Arabia, with Egypt, and with Sahrà; and countries so circumstanced, unless like Egypt, fertilized by the overflowings of a great river, constitute the most arid and desert regions of the earth.

Countries situated within ten degrees of the equator, have commonly two rainy and two dry seasons; but beyond that degree of latitude, intertropical regions have only one rainy and one dry season, the rainy season usually lasting from four to six months, and occurring with great regularity. Beyond the tropics we also find some countries possessing rainy and dry seasons, also occurring with considerable regularity; though others are subject to the variable rains, which, to the north of the 45th parallel of latitude, generally prevail, and of which our own island affords a striking example.

The aërial currents called *winds*, appear to be caused by partial changes in the density of the atmosphere, arising principally from the unequal distribution of heat over the surface of the globe. In Great Britain they are exceedingly changeable, but in some parts of the globe they blow with almost unvaried regularity, and in others are subject to periodical changes.

The most remarkable winds are those denominated the *trade-winds*. In the whole band lying within the tropics, both in the Atlantic and Pacific Oceans, the wind has throughout the year a general direction from the *east*. The

cause of this perpetual current of air has been thus explained :—the heat between the tropics being greater than on the other parts of the earth's surface, and the incumbent air becoming warmer and consequently less dense, it accordingly rises from the surface, when the vacant place is immediately occupied by colder and therefore heavier air, which glides in on both sides from the regions beyond the tropics ; but the air, when apparently at rest, is in fact only relatively so, because it participates in the motion or rotation proper to that part of the earth's surface. Now, we are well aware, that the rotatory velocity is greater in the equatorial regions than in those nearer the poles ; if therefore, currents of air set in from the north and south towards the equator, these, not having the same velocity of rotation as the earth in those regions, must pause or hang back, in a direction opposite that in which the earth is revolving on its axis, *i. e.*, from east to west. It will be evident that these currents, were it not for the earth's rotation, would be simply northerly and southerly winds, but from this cause they acquire a relative direction from the east, and assume the character, in the respective hemispheres, of permanent north-easterly and south-easterly winds. In the centre of this zone, however, these causes cease to act, and the wind altogether loses its easterly character ; so that the equatorial belt is comparatively calm, and free from any steady prevalence of easterly wind. The result of these variations is the existence of two great tropical belts, in the northern of which a north-easterly wind, and in the southern of which a south-easterly wind, must continually prevail.

To the same causes may be attributed the prevalence of westerly winds in higher latitudes. The air, which has become heated in equatorial regions, in rising and flowing towards the poles, carries with it the rotatory velocity due to its equatorial situation, into latitudes where the earth's surface has less motion ; hence, as it travels northwards or southwards, it will advance at a more rapid rate than the earth's surface in the regions it now occupies, thus giving rise to the north-westerly gales of the higher latitudes of the southern hemisphere, and the south-westerly gales so pre-

valent in our latitudes, as well as the almost constant westerly winds of the North Atlantic.

But although the trade winds blow with remarkable constancy in the wide ocean, their general direction is affected by the proximity of land, and a deviation from their regular course may be observed near the shores of America, and yet more strikingly off the coast of Africa, in which region, especially in the vicinity of the Sahrà, the air becomes more heated than over the sea, giving rise to sudden changes and violent storms, which are of frequent occurrence on that coast.

The *monsoons*, or periodical winds of the Indian Ocean, also owe their origin to the proximity of land. In the southern portion of the Indian Ocean, which is remote from this cause of disturbance, the trade-wind blows from the south-east with its wonted regularity; but in the seas between Sumatra and Africa, which form its northern belt, the course of the trade-wind is reversed for half the year, during which period there is a constant wind from the south-west. This change occurs from April to October, and appears to be occasioned by the great rarefaction of the atmosphere in the extensive regions of Southern Asia at that season of the year, the sun being then north of the equator. These winds are distinguished as the south-west and the north-east monsoons; the former of which, passing over the ocean, arrives charged with moisture, and depositing copious supplies of rain, renders the vegetation of India so splendid and beautiful at that season of the year.

Sea-breezes are produced by causes similar to those which give rise to the south-west monsoon. The surface of land being more heated during the day than that of the sea, the air consequently becoming rarefied, rises, and the cooler air being heavier, rushes in from the surface of the sea, thus giving rise to the sea-breeze; this usually commences about ten A.M., and continues throughout the day, until about six in the afternoon, when it gradually dies away. In some situations the reverse takes place at night, the sea at that time retaining a higher temperature than the adjacent land, and causing a *land-breeze* to rise; this usually commences about eight in

the evening, and dies away before six or seven in the morning; it is much fainter and less regular than the sea-breeze, and also of much less general occurrence, requiring particular conditions of surface for its production:—the sea-breeze, on the other hand, is more or less felt on the coasts of all warm countries, and in hot sunny weather may even be observed on our own shores.

In temperate climates, the winds are far less regular than in tropical regions, the general causes which produce them acting with less force and constancy, and the disturbing causes being, therefore, less under control. The most prevalent winds of Great Britain are from the south-west, attributable, as we have just seen, to equatorial heat and the rotation of the earth.

The *hurricanes* of the West Indies, the *typhoons* of the China Seas, and the *ox-eye* of the Cape, where,

. Amid the heavens,
Falsely serene, deep in a cloudy speck
Compressed, the mighty tempest brooding dwells;

are all violent and extraordinary agitations of the air, appearing to have a rotatory motion, being analogous to whirlwinds, and sweeping round, in a regular course, from one point of the compass to another. The *tornadoes* of the western coast of Africa, and the *pamperas* of South America, and the storms called *arched squalls*, are considered by Colonel Reid to be of a different character.

The *sirocco* of Italy and Sicily, and the *solano* of Spain, as well as the *simûn*, or *simoon*, of Arabia, and the *harmattan* of Western Africa, are all winds which owe their origin to the heated surfaces of the sandy districts of Arabia and Africa. The principal difference between these winds appears to be, that the two former acquire some moisture in crossing the Mediterranean, and consequently have not that excessive aridity which characterises the *simûn* and the *harmattan*.

CHAPTER VI.

CLIMATE.

. All around
 Thine equal rays are resting found,
 Yet varying so on various ground
 They pierce and strike,
 That not two roseate cups are crowned
 With dew alike. *Christian Year.*

THE term *climate* is used to express the combination of temperature and moisture which prevails in any particular region. The most prominent causes of diversity of climate are—the heat of the sun, the relative position of land and water, and the elevation of land above the level of the sea. To these may be added, as producing considerable, though less marked effects, the nature of the soil, the prevailing winds, the position of mountain ranges, and the currents of the ocean.

The sun is the grand agent in diffusing heat over the surface of the globe; the temperature of any part, mainly, if not wholly, depending on its exposure to his rays; this being, however, modified by circumstances, the power of the sun's rays being great in proportion to the vertical direction in which they strike the earth. Whenever the sun is above the horizon of any place, that place is receiving heat; when below, parting with it, by the process called *radiation*. Whenever, therefore, the sun remains more than twelve hours above the horizon of any place, and consequently less than twelve hours beneath, the general temperature of that place will be above average; and when the reverse occurs, it will be below average. As the earth revolves on its axis, successive portions of its surface are heated by the solar rays; and, owing to "the simple yet stupendous contrivance of the inclination of the axis of the earth to the plane of its orbit," the northern and southern hemispheres are brought alternately

more directly under the solar influence; and not only do we thus enjoy the varieties of day and night, and the grateful change of the seasons, but by this means the heat of the inter-tropical zone is moderated, and the limits of the temperate regions greatly extended.

The division of the earth into five *zones*, the torrid, the two temperate, and the two frigid, may convey a general idea of the temperature of these respective portions of the earth's surface; and, in fact, did the temperature of any place depend solely on the heat of the sun, this arrangement, or any other, dividing the earth's surface into parallel bands, might present a correct indication of the temperature of each zone. The power of the sun's rays is, however, so modified by other circumstances, that great varieties of temperature are observed to prevail in countries situated in the same parallels or degrees of latitude. Thus, by some observations recently made at New Archangel, on Sitka Island, situated immediately off the western coast of North America, in lat. 57° , it appears that the mean annual temperature at that place is nineteen degrees higher than at Nain, on the coast of Labrador, in the same parallel of latitude. The difference between the winter temperature of the two stations is yet greater, amounting to no less than thirty-six degrees. At Sitka, the snow never lies long on the ground, but usually disappears as soon as it falls. In Labrador, on the other hand, there are hardly two months of the year perfectly free from ice and snow; and the latter accumulates on the plains near the sea to the depth of twenty or twenty-four feet. In the interior of the continent, at Fort Chippewyan, in the same parallel, the summers are much hotter than at Sitka, and the winters more severe even than at Labrador, the thermometer sometimes falling to 20° or 30° below zero. Nor is this remarkable difference of climate confined to America; it is also observable in the Old World, of which the respective climates of Kamtschatka and Great Britain may be mentioned as instances.

This variation of climate appears, in great measure, to be attributable to the different arrangement of land and water, which has been already mentioned as one of the principal causes of diversity of climate.

The waters of that great "climate agent," the ocean, are of very equal temperature, and have, therefore, a tendency to preserve a similar mean, or equal temperature, wherever their influence extends, moderating alike both heat and cold. Thus, when a cold wind passes over the sea, it becomes warmed, and the cold of winter will be moderated. A hot wind, on the contrary, becomes cooled in passing over the sea, and the summer temperature of the adjacent regions will be lowered. And hence we find that the climate of islands, and of countries bordering on the sea, differs considerably from that of the interior of continents, the former being usually characterized by milder winters and more temperate summers. Such countries are said to possess an *insular climate*. When, on the other hand, any region experiences great severity of cold in winter, and at the same time, a considerable degree of heat in summer, it is said to possess an *excessive climate*. Thus, Sitka has an insular climate, the summer temperature being low, and the winter moderate; but Fort Chippewyan presents an instance of an excessive climate. Labrador, from its *littoral* or coast situation, might seem entitled to an insular climate, but the difference between its climate and that of Sitka, is supposed by M. Baer to arise from the configuration of the land; Sitka being completely screened from the influence of the circum-polar regions by the peninsula of Alyaska and the Aleutian Isles, which in general form a range of high land, protecting it from the north and east, and preventing the ice of the arctic regions from drifting to its shores; whilst, at the same time, it is open to the influence of the warm currents flowing from the equatorial regions of the Pacific. Labrador, on the contrary, has no intervening land to protect it from the north, or from the icebergs which are formed in Baffin's Bay, and from whence a current sets southward, bearing these icy masses past its shores. A similar cause is also assigned, by M. Baer, for the temperate climate of the western shores of the Old World; that being preserved from extreme cold by the protection afforded by Nova Zembla, and a submarine ridge extending from thence to Spitzbergen, which forms a barrier to the ice accumulated on, and borne down by the great rivers of Siberia.

The effect produced on climate by the relative position of land and water, is exhibited on a large scale in the difference of climate observable in the northern and southern hemispheres. The space occupied by the waters of the ocean is much greater in the southern than in the northern hemisphere, the consequence of which is, that a much more equable temperature prevails in the former than in the latter. Thus, in Tasmania, or Van Diemen's Land, which is situated about the same distance south of the equator, as Rome is to the north of that line, the winters are milder than at Naples, and the summers not warmer than at Paris.

It is, however, a remarkable fact, that in high latitudes in the southern hemisphere, the cold is much greater than in similar parallels in the northern hemisphere. Thus, in the island of Georgia, which is in the same latitude as Yorkshire, the ground is covered with snow at all seasons of the year. This greater severity of climate has been supposed to arise, partly from the absence of any large surface of land in the temperate region of the southern hemisphere, capable of reflecting the heat of the sun, and partly from the occurrence of some yet undiscovered elevated land within the south polar circle; to which may be added the want of any protecting ridge to screen it from the cold of the latter regions, and the floating icebergs, which are borne from thence by the currents of the ocean.

The *elevation of land above the level of the sea* is another leading cause of the diversity of climate. We have already seen that the air becomes rarefied, or less dense, as we ascend above the level of the sea; we also find a gradual decrease of temperature, in proportion to the elevation of land above that level, (this decrease being about one degree of Fahrenheit for every 656 feet,) until we attain a point where perpetual congelation takes place. This point, which is called the snow-line, or line of perpetual snow, varies in different latitudes, and even in similar latitudes under different conditions; but, generally speaking, a gradual decrease in the elevation of the snow line above the sea level takes place, as we approach the frozen regions of the polar circles. The limit of the snow-line within the tropics is about 16,000 or 17,000 feet above

the level of the sea; and in the northern hemisphere this line descends to the level of the sea, at about latitude 80° . In the southern hemisphere, as we have just seen, the shores of the island of Georgia, situated in latitude 56° , are bound in perpetual frost; it will therefore be evident that the same rules will not apply to both hemispheres; little, however, is yet known on this subject relative to the southern hemisphere; but the following table will convey a general idea of the snow-line in the northern hemisphere, though, owing to local variations, this can only be regarded as an approximation to the truth:—

TABLE OF SNOW-LINE.

Latitude.	Elevation in feet.
0°	16,000
10	16,500
20	17,000
30	14,000
40	10,000
50	6,000
60	5,000
70	1,000
80	0

In considering the above table, we shall perhaps feel some surprise, at finding the snow-line higher at the distance of twenty degrees from the equator, than at the equator itself. This, however, is readily explained by the circumstance that, at the equator, the sun is never more than twelve hours above the horizon; whereas, near the tropics, the longest days are thirteen hours and a-half in length; and, as the sun at that period is vertical or nearly so, the *summer* heat, on which the line of perpetual snow depends, is greater than directly under the equator.

The gradual decrease of temperature at increasing elevations above the level of the sea, has a marked and very beneficial effect, in diversifying the climates over the surface of the globe, and in fitting the earth for the production and maintenance of an almost endless variety of plants and animals. All countries situated between the tropics are subject to an

excessively high temperature; and in such localities, when the land is nearly level with the sea, the heat is extreme: and unless furnished with most abundant supplies of rain, they present a highly parched and arid appearance; such regions being more destitute of vegetation and consequently of animals, than almost any others on the surface of the globe. Of this description is the Sahrà, or Great Desert of Africa. Where tracts of land occur, similar in latitude and elevation, but abundantly supplied with rain, the most luxuriant fertility prevails, enlivened by innumerable tribes of animated beings, but usually insalubrious, and unfitted for the abode of man. Such are the swampy and pestilential shores of Comayagua, or Honduras. At an elevation of about 3000 feet above the sea, however, a totally different climate prevails; thus, the elevated lands of Central America, at no great distance from the last-mentioned district, are described by Colonel Galindo as presenting the most delightful climate imaginable, where "perpetual spring and verdure ever exist, and realize the dream of the ancient European poets, who, without experiencing it, imagined a similar climate for their favourite Elysian fields, or the island of Calypso." At still greater elevations we arrive at the line of perpetual snow. The mountains of Central America, or Guatemala, however, scarcely attain that height above the sea; but the Andes present a vast number of snow-capped summits within the torrid zone.

The snow-line, as has been already observed, is subject to variation in different localities, though situated in the same parallels of latitude. Thus, it appears that an elevated plain, or table-land, in the vicinity of a mountain, tends to elevate the temperature of the mountain, and consequently to raise the snow-line, which will be found to be higher on a mountain so situated than on one that is isolated, or where the ascent is more sudden and precipitous. As it has just been stated that the temperature of elevated land is not so high as that of low plains, we might expect the very reverse to be the case. A familiar illustration, if we may be permitted to introduce it, will perhaps afford the clearest explanation of this phenomenon.

The higher temperature on mountains so situated appears to be owing to the effect produced on the atmosphere by the radiation, and perhaps also the reflection of the sun's rays from the high table-land; an effect very similar to this may be observed in our own dwellings. If the windows of our apartments are situated near the ground, we may, in hot sunny weather, perceive that the temperature of our rooms is increased by the reflection of the sun's rays, more especially if they fall on a stone pavement, for the amount will vary according to the nature of the surface; and should it consist of turf or meadow land, the reflection will be scarcely perceptible. If, then, we ascend into our upper apartments, we shall find the reflection from the stone pavement—partly owing to the greater distance, and partly to the different angle or direction from the ground to the upper window—will, if not wholly without effect, be far less intense, and will communicate little or no heat to the upper rooms. Should, however, a balcony, or a portico, extend in front of our upper windows, this will form no bad representation of a table-land adjoining a mountain; and will, by reflecting the sun's rays directly into our upper rooms, elevate their temperature.

The stupendous Himalaya mountains afford a striking instance of the effect produced by such an elevated table-land. On the *southern* side of this mighty range, in lat. 30° , the snow-line commences at the elevation of about 12,500 or 13,000 feet above the level of the sea; whilst on the *northern* side, where, from the aspect, we might be led to expect a greater degree of cold, the snow-line does not descend below 16,000 feet above the sea. Our readers will readily perceive that this is capable of a satisfactory explanation, when they are reminded that the northern declivity of this mountain mass terminates in the immense elevated plains of Tibet, the surface of which is about 15,000 feet above the level of the sea; whilst on the southern side, the mountains rise directly to a great elevation, from a flat country scarcely 1000 feet above the sea, and covered with a close jungle; of all descriptions of surface the least favourable for radiating heat.

In high latitudes, however, where table-lands occur of sufficient elevation to be covered with snow during the greater

part of the year, the very reverse takes place : and in such situations, the temperature will be lower on mountains so circumstanced, than on such as are isolated. It has even been observed that in sunny calm weather, the temperature on *isolated* mountains in very high latitudes, increases with the elevation. Thus, in Spitzbergen, the temperature at a lower station was found to be about 36° ; and at the summit of a mountain, 1542 feet above the sea, it rose to 40° .

Among the causes which produce some effects on the climate of any region, though not so important as the preceding, is *the nature of the soil*. This is principally owing to the greater or less power any soil possesses of radiating heat. Thus, sandy soils are subject to become rapidly and intensely heated, and when the sun's rays are withdrawn, they readily radiate, or impart to the atmosphere the heat they have acquired, thus increasing the general temperature. Clayey soils, on the other hand, become slowly heated, and as slowly part with heat. Swampy ground chills the air, and extensive forest tracts have a similar effect. And thus, cultivation not unfrequently effects a change in the climate of any country; for if marshes are drained, or forests cleared, the temperature will be raised. Such has been the case in some parts of North America, where the clearing of the forests and the progress of cultivation have improved the climate, and rendered the winters milder. The destruction of woods has, however, proved highly detrimental to the climate of some regions. Thus, the sultry atmosphere and dreadful droughts experienced in the Cape Verde Islands, are attributed to the destruction of the trees in those islands; whilst a remarkable improvement has taken place in the climate of the Island of Ascension since that has been brought into cultivation.

The *prevailing winds* produce considerable effect on the climate of any place; and at the same time the character of a wind depends on the nature of the surface over which it passes, and consequently on the configuration of the land, and the relative position of land and water. The prevailing winds of Great Britain and Western Europe sweep, as we have seen, across the vast Atlantic Ocean; their character is, therefore, usually mild; and those regions are not subject to extremes

of heat or cold. If the wind, in lieu of crossing an expanse of sea, pass over a large tract of land, its character will be greatly influenced by the nature of the surface which it traverses. This is illustrated by the character of the easterly winds in the eastern counties of England. These winds, before they reach our shores, cross the vast plains of Northern Germany. In the latter part of the spring, the surface of those plains is damp and chilly: and the intervening sea not being of sufficient extent greatly to temper them, they bring with them a cold and bleak character, which, especially in our eastern counties, renders these winds at that season so ungenial, and not unfrequently injurious to vegetation. Yet even

. These seeming cruel winds
Blow not in vain: far hence they keep repressed
Those deepening clouds on clouds, surcharged with rain
That o'er the vast Atlantic hither borne
In endless train, would quench the summer blaze,
And cheerless drown the crude unripened year.

But though in spring and early summer these winds are chilly and humid, in the autumnal months they assume a totally different character. At that season, the plains of Germany are usually dry and sandy; they accordingly become warmed, and also radiate a considerable degree of heat: the consequence of which is, that the easterly winds acquire a higher temperature in passing over them, sometimes, indeed, sufficient to raise the thermometer several degrees on our eastern shores, at that period of the year.

The *position of mountain ranges* may also be mentioned as producing considerable effects on the climate of any region, more especially if extending from east to west, and thus, according to their relative position with regard to the lowland districts, screening them from the north, or leaving them unsheltered in that direction. Of this the different climates of Poland and Hungary afford a striking example. The Carpathian Mountains form the separation between the two countries; and Poland, situated to the north of this range, and having no elevated land to protect it from the piercing blasts which sweep across the plains of Northern Europe, suffers from a very cold and humid climate, the winters being nearly as severe as in Sweden. Hungary, on the contrary,

sheltered by the Carpathian mountains from the cold blasts of the north, and sloping gently towards the south, enjoys a milder climate than any part of Germany.

The *currents of the ocean* may be considered as very influential causes of the diversity of climate. The principal currents are produced by the movement of the waters perpetually setting from the polar regions towards the equator, and by the progression of the tropical seas towards the west: both of which originate in the earth's diurnal rotation. By the laws of mechanics, any fluid body in rotation has a tendency to *culminate*, or accumulate in a heap at the part in most rapid motion; and accordingly we find the waters of the polar circles naturally flowing from their own stiller region to that of the more rapidly revolving equatorial zone. Powerful currents are thus formed; which in some instances bear with them vast masses of ice, these being carried to a greater or less distance according to local circumstances, and producing, as we have already seen, so chilling an effect on the climate of Labrador: and probably yet more influencing that of the island of Georgia, in the southern hemisphere. But the water when arrived in the equatorial regions, (like the *aërial currents* already described,) has not a rotatory motion of equal velocity with that of this portion of the globe; and, consequently, has an apparent motion from east to west. Water, also, like air, has less density at a high temperature than when it is cold; and thus the greater warmth of the ocean in intertropical regions will cause it to flow in an upper current towards the poles. A mutual interchange is, therefore, continually taking place between the waters of the warm and cold regions of the globe.

The equatorial, or easterly current, is very apparent, both in the Atlantic and the Pacific, between the parallels of 30° , on each side of the equator; having a mean velocity of nine or ten miles per day in the open sea. The waters which form this current, being generally about three or four degrees cooler than those of the waters under the line, tend to moderate the heat within the tropics.

The most powerful and influential of known currents, however, is that called the Gulf Stream, which issues from

the Gulf of Mexico, where the water, like that of the Mediterranean, and other inland seas in warm latitudes, has a higher temperature than the wide ocean in similar parallels. The temperature of the water in the Mexican Gulf, in summer, is 86° , this being at least seven degrees higher than that of the Atlantic in the same latitude. From this great reservoir of warm water, a constant current pours through the Straits of Bahama, taking a north-easterly course, at the rate of three or four miles an hour. As it proceeds northwards, it flows with diminished velocity, until it is lost on the banks of Newfoundland, where it encounters the great current from the Polar regions. Its course may be traced, not only by its effect in retarding, or speeding, the progress of ships, but more particularly, by the higher temperature it retains; for in N. L. 42° , its waters have still a temperature of 71° , whilst that of the adjacent sea, beyond its influence, is 8° lower, or 63° . It reaches the Azores in seventy-eight days, after flowing nearly 3000 geographical miles.* From thence, extending its course 1000 miles further, it arrives at the Bay of Biscay, still retaining an excess of 5° above the mean temperature of the sea. And, as it has been known to reach this spot in the months of November and January, it probably tends greatly to moderate the cold of winter in Western Europe, along the whole shores of which it is supposed to extend: an inference drawn, not merely from the comparatively high temperature of the British Isles, and of that portion of the continent, but also from the fact, that various seeds and other tropical productions, are occasionally deposited on the shores, even as far north as Norway.

A large tract occurs in the centre of the North Atlantic Ocean, between the parallels of 33° and 35° north latitude, not much less than 2000 miles in length from east to west, and about 350 in width, which has been called by Major Rennell "the recipient of the gulf water." A considerable portion of this area is covered by the sea-weed called sargasso, which the current floats in abundance from the Gulf of Mexico. This mass of water is nearly stagnant, and is warmer by 7° or 10°

* About 3450 British statute miles.

than the waters of the Atlantic in that parallel; its heat being maintained by constant supplies of warm water from the south; and there is reason to conclude that the general climate of some parts of Europe and America may be materially affected by this vast surface of warm water.

It thus appears that the diversities of climate are chiefly dependent on latitude; on the distribution of land and water; and on the elevation of land above the sea: as also on the nature of the soil; the prevalence of particular winds; on currents of the ocean: and some other local circumstances. The causes which affect climate being thus various, it will be evident that great differences of temperature will prevail in different regions, even though situated in similar parallels; and it can only be from actual observations, that the distribution of heat over the earth's surface can be ascertained. This has, in great measure, been effected by De Humboldt; who, from accumulated observations, made by himself and others, has deduced the lines of equal temperature over a considerable portion of the globe. These lines, which are termed *isothermal lines*,* are, excepting perhaps within twenty-two degrees of the equator, neither parallel with that line, nor with each other; being, generally speaking, higher in the western than the eastern regions, both in the Old and New World, and descending lower in America than in Europe; this difference increasing as we recede from the equator. Thus the isothermal line of 59° Fahrenheit passes in Europe between Rome and Florence, in lat. 43° ; but near Raleigh, in North Carolina, it descends to lat. 36° . The line of mean equal temperature of 50° passes through the Netherlands, in lat. 51° ; whilst at Boston, in the United States, it descends to lat. $42\frac{1}{2}^{\circ}$. The line of the freezing point passes through Uloa, in Lapland, between 66° and 68° north lat.; and at Table Bay, on the coast of Labrador, it descends to lat. 54° ; a difference of above 12° of latitude occurring in the latter instance.

When we speak of the *mean annual* temperature of any place or places, it is, however, by no means necessarily im-

* From *isos*, equal, *thermé*, heat.

plied that their climates should correspond. The mean temperature of any station is determined by ascertaining the average temperature of each day in the year, and taking the mean of the whole. And thus, if we were desirous of knowing the mean temperature of the coldest day of winter, and the hottest day of summer, at any two given stations, and we find those of the one station to have been respectively 40° and 60° , and those of the other to have been 20° and 80° ; if we add each of these together, and divide them by two, we shall perceive that the *mean* temperature at both stations will have been 50° ; but it will be evident, that, though this may be similar, the *climate* of the two stations will differ.

Such we shall find to be the case with the annual temperature of various places through which these isothermal lines may pass. In some, the winters may be mild and the summers only moderately warm, whilst in others the extremes of heat and cold may be experienced. Thus, the mean annual temperature of England is 50° , the mean summer temperature being about 63° , and the mean winter about 37° , making a difference of twenty-six degrees: at Pekin, the mean annual temperature is 51° , the summer temperature being 79° , and the winter 23° , making a difference of not less than fifty-eight degrees. The mean annual temperature in these cases is not widely different, but the climate of the two places is wholly dissimilar, the one possessing an insular, and the other an excessive climate.

The difference between the mean summer and winter temperature is usually much less between the tropics than in temperate zones. Thus, at Cumana, which is situated in 10° north latitude, there is only a difference of four degrees between the temperature of the warmest and coldest months.

Isothermal lines, or lines of equal *summer* temperature, and *isochimenal lines*, or lines of equal *winter* temperature,* have been traced in some portions of the globe; and it will be evident that when these shall have been carried out generally, a more correct view of the similarity of the climates of various regions may be obtained than is effected by isothermal lines.

* From *isos*, equal; and from *theros*, summer; and *cheimas*, winter.

But unless it be found that the lines both of summer and of winter temperature meet, even these lines can only afford an approximation to the character of the climates of any two portions of the earth's surface. Thus, Paris and Berlin both possess nearly the same mean *summer* temperature: that of Paris being $64^{\circ} 5'$, and that of Berlin 64° ; but the mean *winter* temperature of Berlin is six degrees and a half lower than that of Paris; that of the one being 38° , and of the other, $31^{\circ} 5'$.

The innumerable diversities on the surface of the globe, to which the various combinations of climate, soil, and temperature give rise, adapt the earth in a remarkable manner for the organized beings with which it is covered. Had a uniform climate been communicated to the whole earth, or even had there been no undulations on its surface, and no alternations of land and water, its productions would, in all probability, have been comparatively limited in variety and number; as at present constituted, however, we find that the bountiful Creator has not only given us abundance, but also almost endless variety, affording us unbounded scope for research, and for admiration of the supreme wisdom which is displayed in every part of the natural world; thus leading us to feel and to acknowledge that

. Needs must the Power
That made us, and for us this ample world,
Be infinitely good, and of this good
As liberal and free as infinite.

KEY TO THE PLATE OF GEOGRAPHICAL DISTRIBUTION OF PLANTS.

EXOGENÆ.

1 Oriental poppy,	<i>Papaver orientale.</i>
2 Egyptian lotus,	<i>Nymphaea lotus.</i>
3 Sacred bean,	<i>Cyamus nelumbo.</i>
4 Nutmeg,	<i>Myristica moschata.</i>
5 Tulip tree,	<i>Liliodendrum tulipiferum.</i>
6 Winter's bark,	<i>Drimys winteri.</i>
7 Persian ferula,	<i>Ferula persica.</i>
8 Carrot,	<i>Daucus carota.</i>
9 Caraway,	<i>Carum carui.</i>
10 Ginseng,	<i>Panax quinquefolium.</i>
11 Scarlet ribes,	<i>Ribes sanguineum.</i>
12 Vine,	<i>Vitis vinifera.</i>
13 Mangrove,	<i>Rhizophora gymnorhiza.</i>
14 Brown gum tree,	<i>Eucalyptus robusta.</i>
15 Allspice tree,	<i>Myrtus pimento.</i>
16 Clove tree,	<i>Caryophyllus aromaticus.</i>
17 Pomegranate,	<i>Punica granatum.</i>
18 Sapucaya nut,	<i>Lecythis zapucajo.</i>
19 Cucumber,	<i>Cucumis sativus.</i>
20 Melon,	—— melo.
21 Melon cactus,	<i>Melocactus.</i>
22 Peruvian cactus,	<i>Echino cactus.</i>
23 Cochineal cactus,	<i>Opuntia cochinillifera.</i>
24 Hottentot's fig,	<i>Mesembryanthemum edule.</i>
25 Turnip,	<i>Brassica napa.</i>
26 Caper plant,	<i>Capparis spinosa.</i>
27 Papaw tree,	<i>Carica papaya.</i>
28 Mangosteen,	<i>Garcinia mangostana.</i>
29 Tea tree,	<i>Thea viridis.</i>
30 Sugar maple,	<i>Acer saccharinum.</i>
31 Tartarian maple,	—— tataricum.
32 Broad-leaved maple,	—— macrophyllum.
33 Flax,	<i>Linum usitatissimum.</i>
34 Silk cotton tree,	<i>Bombax ceiba.</i>
35 Baobab.	<i>Adansonia digitata.</i>
36 Cacao, or chocolate tree,	<i>Theobroma cacao.</i>
37 Cotton plant,	<i>Gossypium herbaceum.</i>
38 Nankin cotton,	—— religiosum.
39 Camphor tree,	<i>Dryobalanops camphora.</i>
40 Linden, or lime tree,	<i>Tilia europea.</i>
41 Hennéh, or chenna,	<i>Lawsonia inermis.</i>
42 Mahogany,	<i>Swietonia mahagoni.</i>
43 Orange tree,	<i>Citrus aurantium.</i>
44 Lemon tree,	—— limonum.
45 Citron, or lime,	—— limetta.
46 Myrrh,	<i>Amyris kataf.</i>

47 Linear-leaved croton,	<i>Croton cascarilla.</i>
48 Box,	<i>Buxus sempervirens.</i>
49 Mandioc, or cassava,	<i>Jatropha manihot.</i>
50 Caoutchouc tree,	<i>Siphonia elastica.</i>
51 Tallow tree,	<i>Stillingia sebifera.</i>
52 Cape Euphorbia,	<i>Euphorbia meloformis.</i>
53 Great-flowered spurge,	—— <i>corollata.</i>
54 Manchineal,	<i>Hippomane manicella.</i>
55 Arctic bramble,	<i>Rubus arcticus.</i>
56 Cloud berry,	—— <i>chamæmorus.</i>
57 Strawberry,	<i>Fragaria canadensis.</i>
58 Apple,	<i>Pyrus malus.</i>
59 Siberian crab,	—— <i>prunifolia.</i>
60 Cherry,	<i>Prunus cerasus.</i>
61 Myrobalan plum,	—— <i>cerasifera.</i>
62 Apricot,	—— <i>armeniaca.</i>
63 Almond,	<i>Amygdalus communis.</i>
64 Indigo,	<i>Indigofera tinctoria.</i>
65 Gum tragacanth,	<i>Astragalus creticus.</i>
66 African earth nut,	<i>Arachis hypogæa.</i>
67 Locust tree, or false acacia,	<i>Robinia pseud-acacia.</i>
68 Brazil wood tree,	<i>Cæsalpinia braziliensis.</i>
69 Logwood tree,	<i>Hæmatoxylon campechicum.</i>
70 Tamarind,	<i>Tamarindus indicus,</i>
71 Egyptian cassia,	<i>Cassia acutifolia.</i>
72 Gum Arabic,	<i>Acacia arabica.</i>
73 Wattle tree,	—— <i>discolor.</i>
74 Rosewood tree,	<i>Mimosa jacaranda.</i>
75 African locust tree,	<i>Inga biglobosa.</i>
76 Tonquin bean,	<i>Dipterix odorata.</i>
77 Mango,	<i>Mangifera indica.</i>
78 Lacquer plant,	<i>Stagmaria verniciflua.</i>
79 Beech tree,	<i>Fagus sylvaticus.</i>
80 Sweet chestnut,	<i>Castanea vesca.</i>
81 Oak,	<i>Quercus robur.</i>
82 Cork tree,	—— <i>suber.</i>
83 Birch,	<i>Betula nigra.</i>
84 Weeping birch,	—— <i>pendula.</i>
85 Shrubby birch,	—— <i>fruticosa.</i>
86 Dwarf birch,	—— <i>nana.</i>
87 Alder,	<i>Alnus incana.</i>
88 Common nettle,	<i>Urtica dioica.</i>
89 Hemp,	<i>Cannabis sativa.</i>
90 Hop,	<i>Humulus lupulus.</i>
91 White mulberry,	<i>Morus alba.</i>
92 Paper mulberry,	<i>Broussonetia papyrifera.</i>
93 Banyan tree,	<i>Ficus religiosa.</i>
94 Fig tree,	—— <i>carica.</i>
95 Caoutchouc fig tree,	—— <i>elastica.</i>
96 Bread fruit tree,	<i>Artocarpus incisa.</i>
97 Jaca, or Jack,	—— <i>integrifolia.</i>
98 Cow tree,	<i>Galactodendron utile.</i>
99 Upas tree,	<i>Upas.</i>
100 Elm tree,	<i>Ulmus campestris.</i>

101 Candleberry myrtle,	<i>Myrica cerifera</i> .
102 Illinois nut,	<i>Juglans olivæformis</i> .
103 Black walnut,	—— <i>nigra</i> .
104 Hicory,	—— <i>tomentosa</i> .
105 Common walnut,	—— <i>regia</i> .
106 Casuarina,	<i>Casuarina equisetifolia</i> .
107 Pepper,	<i>Piper nigrum</i> .
108 Weeping willow,	<i>Salix babylonica</i> .
109 Dwarf willow,	<i>Salix adscendens</i> .
110 Hudson's Bay poplar,	<i>Populus hudsonia</i> .
111 Italian poplar,	—— <i>dilatata</i> .
112 Black poplar,	—— <i>nigra</i> .
113 Aspen tree,	—— <i>tremula</i> .
114 American plane,	<i>Platanus occidentalis</i> .
115 Sandal-wood tree,	<i>Santalum album</i> .
116 Banksia,	<i>Banksia speciosa</i> .
117 Cinnamon,	<i>Laurus cinnamomum</i> .
118 Benjamin tree,	—— <i>benzoin</i> .
119 Bay tree,	—— <i>nobilis</i> .
120 Buckwheat,	<i>Polygonum fagopyrum</i> .
121 Rhubarb,	<i>Rheum palmatum</i> .
122 Columbo root,	<i>Menispermum palmatum</i> .
123 Cape heath,	<i>Erica fascicularis</i> .
124 Cranberry,	<i>Oxycoccus macrocarpus</i> .
125 Ebony tree,	<i>Diospyros ebenum</i> .
126 Paraguay tree,	<i>Ilex paraguensis</i> .
127 Crenated convolvulus,	<i>Convolvulus hermanniae</i> .
128 Sweet potato,	—— <i>batatas</i> .
129 Quinquina,	<i>Cinchona condaminea</i> .
130 Negroes' peach,	<i>Sarcocephalus esculentus</i> .
131 Coffee,	<i>Coffea occidentalis</i> .
132 Teazle,	<i>Dipsacus fullonum</i> .
133 Teak tree,	<i>Tectona grandis</i> .
134 Calabash tree,	<i>Crescentia cujete</i> .
135 Potato,	<i>Solanum tuberosum</i> .
136 Tobacco,	<i>Nicotiana tabacum</i> .
137 Stapelia,	<i>Stapelia asterias</i> .
138 Olive,	<i>Olea Europea</i> .
139 Zamia,	<i>Zamia spiralis</i> .
140 Broad-leaved cycas,	<i>Cycas circinalis</i> .
141 Scotch fir, or pine,	<i>Pinus sylvestris</i> .
142 Siberian stone pine,	—— <i>cembra</i> .
143 Douglas pine,	—— <i>taxifolia</i> .
144 Bourdeaux turpentine fir,	—— <i>maritima</i> .
145 Stone pine,	—— <i>pinæa</i> .
146 Swamp pine,	—— <i>palustris</i> .
147 Scrub pine,	—— <i>banksiana</i> .
148 Siberian silver fir,	<i>Abies picea</i> .
149 Norway spruce fir,	—— <i>excelsa</i> .
150 Black spruce,	—— <i>nigra</i> .
151 Canada balsam fir,	—— <i>balsamifera</i> .
152 Hemlock spruce,	—— <i>canadensis</i> .
153 Common spruce fir,	—— <i>communis</i> .
154 Siberian cedar,	—— <i>sibirica</i> .

155 Cedar of Lebanon,
 156 Larch,
 157 Norfolk island pine,
 158 Araucarian pine,
 159 Arbor vitae,
 160 Sandarach tree,
 161 Deciduous cypress,
 162 Daurian juniper,
 163 Frankincense,

Abies cedrus.
 — *larix.*
Araucaria excelsa.
 — *imbricata.*
Thuja occidentalis.
 — *quadrivalvis.*
Taxodium distichum.
Juniperus dahurica.
 — *lycia.*

ENDOGENÆ.

164 Ginger,
 165 Turmeric,
 166 Arrowroot,
 167 Banana,
 168 American aloe,
 169 Ixia,
 170 Pine apple,
 171 Vanilla,
 172 Palmetto, or dwarf palm,
 173 Wax-bearing palm,
 174 Fan palm,
 175 Date palm,
 176 Sago palm,
 177 Calamus,
 178 Palmyra palm,
 179 Doom palm,
 180 Betel-nut palm,
 181 Cabbage palm,
 182 Thorn-leaved palm,
 183 Cocoa-nut palm,
 184 Double cocoa-nut,
 185 Oil-palm,
 186 Attalea,
 187 Wax-coated palm,
 188 Onion,
 189 Garlic,
 190 Gum dragon tree,
 191 Soccotrine aloe,
 192 Great hedge aloe,
 193 Xanthorrhæa,
 194 New Zealand flax,
 195 Grass tree,
 196 Hottentot's bread,
 197 Yam,
 198 Branching screw pine,
 199 Screw pine,
 200 Egyptian arum,
 201 Sugar cane,
 202 Millet, or dhoorah,
 203 Maize,
 204 Rice,
 205 Sesamum,

Zinziber officinalis.
Curcuma longa.
Maranta arundinacea.
Musa sapientum.
Agave americana.
Ixia fucata.
Ananassa.
Vanilla aromatica.
Chamærops humilis.
Corypha cerifera.
 — *umbraculifera.*
Phoenix dactylifera.
Sagus farinifera.
Calamus zaiacca.
Borassus flabelliformis.
Hyphome thebaica.
Areca catechu.
 — *oleracea.*
Caryota urens.
Cocos nucifera.
Lodoicea sechellarum.
Elais guineensis.
Attalea funifera.
Ceroxylon andicola.
Allium cepa.
 — *tataricum.*
Dracena draco.
Aloe soccotrina.
 — *ferox.*
Xanthorrhæa hastile.
Phormium tenax.
Ringia australis.
Tamus elephantopus.
Dioscorea sativa.
Pandanus candelabrum.
 — *spiralis.*
Colocasia esculenta.
Saccharum officinarum.
Sorghum halepense.
Zea mays.
Oriza sativa.
Sesamum orientale.

206 Rye,	<i>Secale cereale.</i>
207 Wheat,	<i>Triticum hybernum.</i>
208 Oats,	<i>Avena sativa.</i>
209 Barley,	<i>Hordeum vulgare.</i>
210 Bamboo,	<i>Bambusa arundinacea.</i>
211 Papyrus,	<i>Cyperus papyrus.</i>
212 <i>Rafflesia</i> ,	<i>Rafflesia.</i>
213 Tree fern,	<i>Cyathea arborea.</i>
214 Mushroom,	<i>Agaricus muscarius.</i>
215 Tripe de Roche,	<i>Gyrophora.</i>
216 Cudbear,	<i>Parmelia.</i>
217 Iceland moss,	<i>Cetraria icelandica.</i>
218 Reindeer moss,	<i>Cladonia rangiferina.</i>
219 Orchell,	<i>Rocella tinctoria.</i>
220 Sargasso, or gulf-weed,	<i>Fucus natans.</i>

CHAPTER VII.

GEOGRAPHICAL DISTRIBUTION OF PLANTS.

The living herbs, profusely wild,
O'er all the deep green earth, beyond the power
Of botanists to number up their tribes.—THOMSON.

MULTITUDES of different species of plants are spread over the surface of the earth; not indiscriminately, and presenting the appearance of having been scattered at random, but each and all being especially adapted for their natural abodes, or, in other terms, their natural *stations* and *habitations*.

The natural *station* of a plant is determined by the nature of the surface or of the soil. Thus, some species confine themselves entirely to water, these being again subdivided into those of the marsh, the lake, the river, and the ocean; other species belong to the land, and of these we find some peculiar to valleys, others to plains, and others to mountains, the latter being distinguished by the designation of *alpine plants*. Some, again, affect a clayey soil, some a chalky, and some a sandy soil; whilst others will thrive only in soils impregnated with soda and muriatic salt. Some plants are parasitical, taking root in the stems and branches of other plants.

We also find that some plants flourish only when exposed to the action of strong light, whilst others prefer the shade, and others again spring up, even when altogether excluded from light, being formed for tenanting caverns, and other dark recesses of the earth.

The natural *habitation* of a plant is dependent on the climate which is best adapted to its perfect development. Thus we find, that some species require the hottest climates, others delight in mild and temperate ones, others thrive only in the midst of ice and frost. A large proportion require a constantly humid atmosphere; several succeed in a dry air; though the greater number are equally averse to the extremes of dryness and moisture. Excess of heat, cold, or drought, are the only obstacles to the growth of plants. The result of this remarkable adaptation of plants to particular climates, situations and soils, is, not only that nearly the whole earth is clothed with vegetable life, but also that an almost endless variety exists among these productions, and we are almost tempted to exclaim with the poet,

The earth was made so various, that the mind
Of desultory man, studious of change
And pleased with novelty, might be indulged.

But although some plants—such for instance as the common heath, or ling—affect a sandy soil and temperate climate, we by no means find that the species is met with in all similarly circumstanced localities; on the contrary, it usually happens that most species, and some genera, are confined to certain districts, more or less extended. Some species, indeed, are limited to the narrowest bounds;—thus, a species of marjoram (*Origanum Tournefortii*), which was discovered by Tournefort, in the year 1700, in the little island of Amorgos, growing *upon one rock only*, was observed eighty years afterwards on the self-same rock, but has never been met with in any other place. This, it is true, is an extreme case, and most species of plants have a wider range; but we find, that almost every country, or rather, perhaps, every natural division of the globe, possesses a *flora*, or assemblage of indigenous plants peculiar to itself. A considerable difference is even observable between the native plants of the eastern and western dis-

tricts of Great Britain ; and although many species are common to these islands and to some parts of Europe, the number peculiar to our shores is by no means inconsiderable : we shall therefore readily suppose that the plants in distant regions will differ greatly ; and accordingly we find that the Old and New World contain a very small number of identical species.

It must be understood that we are speaking of *species*, and not of *genera* ; for although it is true that some genera or kinds of plants may be peculiar to each great division of the globe, this is not usually the case. We, however, frequently find a preponderance of some particular kinds in particular regions. Thus, the saxifrages and mosses are more abundant in the Arctic regions than any other genera, and also more so in those districts, than in any other portion of the globe. Mexico, and the adjacent countries of the New Continent, are characterized by the preponderance of cacti ; Southern Africa is marked by that of plants of the mesembryanthemum tribe, &c.

But although it thus appears that plants have their native regions, from whence they have been more or less spread by natural means, or by the agency of man, the geographical distribution of plants over the earth's surface may be considered as mainly dependent on temperature, modified by the moisture or dryness of the atmosphere.

The great influence temperature exercises on vegetation is shown in the different character of the floras of cold, temperate, and hot climates. Vegetation within the tropics fills the European traveller with amazement, by the majesty and vigour of its aspect. The towering height of the trees, the circumference of their stems, the richness and variety of their foliage, as well as the bright and finely contrasted colours of their blossoms, all combine to give splendour to the scene ; whilst the graceful foliage, and the columnar stems of the palms and arborescent ferns, give it a peculiar and striking character ; and the aromatic plants, the far greater number of which are natives of these regions, fill the air with their perfumes. There, also, gigantic climbing plants tower to the top of the loftiest trees ; and magnificent herbs grow to the height of the trees of our orchards, with flowers and foliage



The Fan Palm.—*Corypha Umbraculifera*.

not less pre-eminent in their dimensions. As an instance of the gigantic vegetation of tropical regions, we may mention the *corypha umbraculifera*, or fan-palm, an East Indian species, which has leaves in the form of an umbrella, eighteen feet across. The *aristolochia*, a plant growing on the River Magdalena, bears flowers of such large dimensions, that, according to De Humboldt, they serve the children for hats.

Some genera of plants are confined exclusively to tropical regions, but the greater number have their representatives, or plants of the same tribe, growing in temperate climates. A comparison of the difference of their dimensions in the different regions, will form a striking exemplification of the luxuriance of tropical vegetation, and of the influence of temperature on its development. Thus, the graminæ, or grass tribe, are met with in most parts of the world; in the cold and temperate climates of our quarter of the globe they appear in the form of a dwarf, turfy herbage; in hot regions they are on a greatly larger scale,—the grasses of tropical climates sometimes attaining the height of twenty-four feet. The *fabaceæ*, called also *leguminosæ*, or pulse tribe, furnish Europe with many herbaceous species, several shrubs, and one-middle-sized tree (the laburnum), all of which have leaves composed of a small number of leaflets. The same tribe in hot climates teems with lofty trees, graced with leaves of the most delicate texture, divided and subdivided into numerous leaflets, and playing in the wind like plumes of feathers. All plants of the mallow tribe, with us, are either herbaceous, or small shrubs, and of little importance,—in hot climates they appear in the form of trees, and indeed hold a conspicuous place among the plants of tropical regions, including among their number the colossal *Adansonia digitata*, or baobab tree (Plate IV., fig. 35), the giant of vegetable creation, which is a native of the hot regions of Africa. This tree is supposed to exceed almost any other in longevity. M. Adanson (from whom the tree is named) inferred that a baobab tree which he saw growing at Senegal, and which he carefully examined, must have attained the age of 5150 years.*

* This inference was drawn from the number of concentric rings of annual growth. The trunk of this tree was thirty feet in diameter.

Compared with the rich and varied vegetation of intertropical regions, that of Europe appears at first sight poor and insignificant; but although the plants of temperate zones do not rival those of hot climates, either in number of species or in splendour of appearance, yet the milder regions of the earth, so far from being destitute of important vegetable productions, are, on the contrary, abundantly provided with plants of the greatest utility, bearing the appearance of being constituted expressly for thriving in such climates; nor are these species more adapted to arrive at perfection in the torrid regions of the earth, than are equatorial species to thrive in temperate latitudes. Thus beautifully has the all-wise and beneficent Creator adapted the vegetable productions of the earth to its varied climates; new supplies of species, fitted to thrive in new conditions, perpetually recurring, as we recede from the equator to the poles; so that although some species cease to make their appearance, others are met with, to supply the place of those of which we have lost sight.

We thus find that the rich tropical vegetation, including the palms and arborescent ferns, first gives place to oaks and other inhabitants of temperate climates. These are again superseded by other plants which seem to delight in cold,—pines, firs, and birches constituting the forests which form the natural decoration of a northern land. Birch endures a severe climate better than the other tribes, but becomes stunted as it enters the colder regions, and ceases to grow at N. lat. 70°. Beyond this, shrubs, bushes, and herbaceous plants alone are met with; the dwarf willow, bramble, daphne, and wild thyme, cover the face of the rocks. These at length disappear, and are succeeded by low herbs furnished with leaves at the root, from the midst of which rises a short stalk surmounted by small flowers,—such are the saxifrages, the gentians, and the primroses. These plants take up their quarters in the clefts of the rocks, whilst the grasses, with their numerous slender leaves, spread themselves over the soil. The lichen, or moss, which forms the food of the reindeer, in some places mingles with this turf, whilst in others it covers vast tracts of country, its white tufts looking like hillocks of snow which the sun has not yet dissolved. If we

proceed further, sterile soil, or bare rocks, and perpetual snow, everywhere meet the eye, the last vestiges of vegetation being some pulverent *byssi* and mosses, which spread over the rocks in motley patches.

The above remarks, however, apply more especially to European vegetation, for they are by no means applicable to the southern hemisphere; and even North America (at least its eastern portion), owing to its excessive climate, differs greatly in the character of its vegetation. In its more northerly latitudes, the greater degree of cold of the New World arrests the northward progress of many plants which thrive in similar latitudes in Europe; whilst in the parallels of England and France, the greater warmth of the American summers gives a richness of character to its vegetation, which those countries do not possess. Thus, it numbers among its indigenous trees the catalpa, the robinia, or false acacia, called also the locust tree (fig. 67), the tulip tree (fig. 5), besides numerous others of varied and beautiful foliage, and bearing elegant and conspicuous blossoms, among which the magnolia stands pre-eminent, growing in the form of a tree, and adorned with the most superb flowers; that portion of America, from the occurrence of this splendid tree, having been denominated the region of magnolias.

The indigenous trees of our own country, on the other hand, are comparatively little varied in their foliage, and in some species the blossoms are so insignificant in their appearance, that many persons who connect the idea of a flower with a coloured corolla, are scarcely aware that they have any blossom at all. Of this description are the flowers of the elm, which come forth before the trees are in leaf; and which, owing to the smallness of their size, and the height at which they mostly grow, are principally indicated by a general thickening of the upper branches.

We have already seen that a similarity exists between the temperature of the summits of elevated mountains in the hot regions of the earth, and that of land near the level of the sea in very high latitudes. A remarkable correspondence is also observable between the plants which form the floras of the regions bordering on perpetual snow upon such moun-

tains, and those which constitute the flora of high latitudes. Thus, in Dr. Hooker's recent transit across the Himalaya range, he discovered on the rocks of the elevated Mount Donkiah, a species of lichen, the *lecanora triniata*, which he had before met with in Cockburn Island in the South Polar Sea, and only in that locality; this lichen in both instances colouring the rocks with a bright orange red tint, so effulgent as to be visible at the distance of several miles. Nor is this correspondence wholly confined to the coldest districts; for although the resemblance is not so striking between the indigenous plants growing in the middle region of a mountain within the tropics, and those of temperate zones, yet a general correspondence occurs; and the native plants of milder climates are capable of successful cultivation in such situations.*

It thus appears that, in equatorial regions, as we ascend above the level of the sea, vegetation undergoes modifications analogous to those attending its progress to either pole; with this difference, however, that in the one case the phenomena succeed each other by almost imperceptible gradations, whereas in the ascent of a mountain, they follow in rapid succession. Thus, on the mountains of equinoctial America, the grades of vegetation are displayed to the view of the observer, as on the gradually rising steps of a vast amphitheatre, the base of which is the level of the sea, whilst the summit reaches to the limits of perpetual snow: and the northern and southern hemispheres have not inaptly been compared to two such mountains, placed base to base, the countries under the equator representing the foot, and the north and south polar regions representing the summits enveloped in perpetual snow.

In equinoctial regions, the distribution of plants is much influenced by the mean *annual* temperature; but in temperate zones, it is chiefly dependent on the *summer* temperature,—whether that be sufficient for the plant to ripen its

* The genus of plants which possesses the widest range, appears to be the *salix*, or willow tribe; some species of which have been met with in almost every region of the globe, and at almost every elevation above the sea, where sufficient moisture occurs to favour their growth.

fruit; and also on the *winter* temperature, that is, on what degree of cold any plant is fitted to endure. Thus, some plants require a gentle heat of long continuance, and will not stand a severe frost: others thrive best where extremes of heat and cold are experienced, owing to their power of withstanding a considerable degree of cold while their sap is quiescent:

The north cannot undo them,
With a sleety whistle through them,
Nor frozen thawings glue them
From budding at the prime.

And yet such plants may, when once their sap is set in motion, require a higher degree of heat to bring them to perfection. An acquaintance with the natural habits of plants is of great importance in horticulture. In some species, the sap is readily set in motion by the first gleam of sunshine; and in our variable climate, it not unfrequently happens, that warm sunny days of spring are succeeded by sharp frosts. Plants, therefore, which are natives of regions where even a more severe winter prevails than we usually experience, but which is at once succeeded by genial and less variable weather, often suffer, or perhaps perish, in late frosts in this country. Of this, the Norway spruce fir may be mentioned as an instance. But the well-informed cultivator will cautiously avoid exposing such plants (which also include many of the American species we are attempting to naturalize) to a southern aspect at that season of the year. Some plants, it has been remarked, require a certain degree of summer temperature to bring their fruit to perfection. Thus, wheat, to ripen well, requires a mean summer temperature of 57° or 58° ; it will not, therefore, succeed in countries where the summer temperature is below that average: and accordingly, it not unfrequently happens that, in cold and rainy seasons, this valuable grain fails of coming to perfection in some parts of England.

The climate of islands is, as we have already seen, much milder or more equable than that of continents; and thus, though London is full two degrees and a half further north than Paris, its climate is so much milder, that many species of plants may be cultivated in the open ground, in the

vicinity of the British metropolis, which will not thrive without the shelter of a green-house in Paris.

Seventy or eighty thousand species of plants are known to botanists, and unquestionably a large number remain undescribed. The amount of species inhabiting tropical regions bears a very large proportion to that of the inhabitants of temperate climates, and these again are much more abundant than those of Arctic regions. Thus, in Spitzbergen, botanists compute that there are not above thirty species, and in Jamaica about four thousand. To obtain, however, a correct view of these proportions, we must ascertain how many species belong *exclusively* to some particular regions, how many are common to two or a greater number of regions, how many are spread over every portion of the globe—knowledge which it must require the lapse of ages to acquire.*

One of the great uses to which the vegetable wealth of the earth is applicable, is the benefit of man, whom it in great measure supplies with food and clothing. The all-bountiful Author of Nature has, in almost every region of the globe,† provided certain vegetable productions suited for the food of man, and especially adapted to thrive in those particular climates. By cultivation, man has been enabled to extend the range of many of those valuable plants beyond their natural limits. All plants, as we have seen, require certain conditions of temperature and moisture, and although it would be worse than vain to strive against the provisions of nature and attempt to introduce plants into regions wholly uncongenial to their nature, or where their produce ceases to be valuable,‡ there is no law against spreading every good conferred on man by the beneficent Creator, to all countries capable of profiting by their introduction.

* M. Decandolle estimates the total number of existing vegetables at from 110,000 to 120,000.

† It is mentioned by some authors, as "a fact, notorious as surprising, that no one vegetable belonging to the countries towards the South Pole produces a single fruit fit for the food of man." This assertion is, however, disproved by the recent travels of Sir J. Alexander, in South Western Africa, he having met with, near Walviah Bay, "an admirable fruit, about the size of a shaddock, on which the natives subsist for two or three months in the year."

‡ Thus the ash yields manna in Calabria, but loses that quality as it advances into the north.

If we turn our attention to the equatorial regions, we find the *banana* or *plantain* (fig. 167), holding a conspicuous place among plants of especial utility to man. This valuable plant, of the particular species called the banana, forms a primary article of food among the natives of tropical America, where it flourishes luxuriantly in the low plains, but will not ripen its fruit at the elevation of 4500 feet above the sea; nor can it be cultivated with advantage further north in the New World than lat. 27° ; though in Syria, the species called the plantain succeeds as far north as lat. 34° . The *jatropha manihot*, *mandioc*, or *cassava root* (fig. 166), from which we obtain our tapioca, forms another important article of food in South America, and an Indian, after severe toil, will make a hearty meal on three ripe plantains and a small portion of cassava bread. The *convolvulus batatas*, or Spanish potato (fig. 128), also forms a valuable article of food in the New World, as far north as lat. 36° .

The graceful *cocoa-nut palm* (fig. 183) also belongs to inter-tropical climes, flourishing especially on islands, and near the sea shores, and affording abundant supplies of food to the natives of those regions. Its range may be considered as terminating nearly where that of wheat commences. The *date* (fig. 175), another species of palm, yields one of the most nutritive fruits in existence. This valuable plant thrives especially in a hot and dry climate, thus being of peculiar utility, in furnishing food for the inhabitants of the sun-burnt plains bordering on the deserts of Africa and Arabia; to which, however, the date-palm is not wholly confined, as it grows in the Canary Islands, and its range extends to Palestine and Hindostan. It has been introduced into the South of Spain.

The very valuable *bread-fruit tree* (fig. 96) is indigenous in some parts of South-eastern Asia, and also in the Polynesian Islands; of which latter, as well as of the East Indian archipelago, the *yam* (fig. 197) is also a native. The yam is much improved by cultivation, and has been very generally and successfully spread in intertropical countries.

The *pandanus*, or screw pine (fig. 199), constitutes the principal nourishment of the natives of the Caroline Islands.

Perhaps, however, one of the most extensively cultivated, and at the same time most important nutritive plants belonging to intertropical regions, is the *maize*, or *Indian corn* (fig. 203). Aided by the joint influence of heat and moisture, it shoots up luxuriantly, and yields the most astonishing produce. Nor is it by any means wholly confined to intertropical regions; for, though it may not flourish with equal vigour, it can be successfully cultivated in any district where the mean summer temperature is about 68° ; maize, accordingly, will thrive in some parts of France, and is raised in great abundance in the department of Sarthe. It is also cultivated in other parts of Europe; but the summers in Great Britain are usually too cold to admit of its coming to perfection in this country. In Asia, it extends to about latitude 48° , and to 46° in America.

The small species of grain called *millet* or *dhoorah* (fig. 202), does not succeed further north than lat. 45° or 47° . This grass, little productive as it appears, almost entirely furnishes some populous districts with nourishment, particularly in various parts of Asia and of Northern Africa.

Rice (fig. 204) has been cultivated in the southern regions of Asia, from the remotest antiquity. It requires abundance of water, and a mean summer temperature of about 74° ; and Piedmont presents the most northerly district in which it can be cultivated with advantage: all attempts to introduce it into this country must therefore prove unsuccessful. Perhaps, of all plants, rice furnishes food for the greatest number of human beings, for, besides being most extensively used among the negro population in its adopted country, America—it constitutes the staple food of the various Indian tribes of the Chinese, Japanese, &c. And in such estimation is it held by the natives of the Indo-Chinese countries, that on being informed by a recent traveller that Great Britain produced no rice, they evidently regarded its inhabitants as objects of pity, expressing their surprise that they could possibly subsist without rice.

The range of the *sugar cane* (fig. 201) extends in America to about lat. 30° on each side of the equator, and in the Old World to about lat. 35° or 36° .

Neither the *olive* (fig. 138) nor the *vine* (fig. 12) come to perfection at the level of the sea under the equator. The range of the olive in the Old World, embraces two zones or bands, north and south of the equator, about nine degrees in width, from lat. 35° to lat. 44° . The climate of the New World is not favourable to the culture of this plant, as it suffers both from the extremes of heat and of cold, to which that continent is subject. The vine comes to perfection in Europe, as far north as lat. 50° or 52° ; its range in America is much more limited, a difference of ten degrees occurring between its northerly limits in the Old and the New World. Its profitable culture in Europe does not, however, extend much beyond lat. 48° , and the best wines are produced between 30° and 45° north latitude. The grape, in the south of Europe, abounds in matter of a sweet quality; in the north it contains an excess of acid; thus forming a striking illustration of the influence of temperature in bringing fruits to perfection. The vine being propagated by layers, and its perpetuation not being, therefore, dependent on the ripening of the seed, may be cultivated in less genial climates; for, as long as the degree or duration of heat is sufficient for the organic functions to be carried on (and even when these are carried on imperfectly), this plant will continue to grow, but its growth will be stunted, and it will produce no fruit.

Among the plants of utility for the food of man, the *Cerealia*, or all kinds of bread-corn, hold a foremost rank. These valuable productions do not succeed at or near the level of the sea in intertropical regions, but may be cultivated in elevated situations, even under the equator. Thus, *wheat* comes to perfection in equinoctial regions, between the levels of 4500 and 10,000 feet above the sea. The range of oats is rather more elevated; and that of barley higher than oats. In the temperate zones of the northern hemisphere, the climate best adapted for the growth of wheat may be considered as commencing at about lat. 30° ; but the northern limit varies greatly in different regions with their varying climates. Thus, in Great Britain, the most northerly successful cultivation of wheat is near Inverness, about lat. 57° ; but in Norway, this grain comes to perfection at Drontheim, lat. 64° , which

appears to be its extreme northern limit: in America it has not hitherto succeeded beyond lat. 58° . *Oats* and *rye* do not require so high a summer temperature to ripen them, and therefore succeed in more northern latitudes than wheat. *Rye*, however, on approaching to maturity, requires dry weather, which renders it more adapted for continental than insular cultivation. But, of all the *Cerealia*, *barley* has the most northern range. This grain, except in particularly unfavourable seasons, succeeds in the Orkney and Zetland Isles; and in Western Lapland its cultivation extends nearly to lat. 70° .

Of all the vegetable productions especially adapted for the sustenance of man, the *potato* (fig. 135) has the widest range. According to De Humboldt, the culture of this invaluable root extends from the extremity of Africa, to Labrador, Iceland, and Lapland. This, however, must be understood with some limitation, for it will not thrive in the lowlands of intertropical regions; but it is cultivated with great success at the elevation of 8000 or 9000 feet above the sea. At San Mateo, in Peru, the potato is grown at the height of nearly 11,000 feet. South America is considered as the native country of the potato; and it is well known that it was introduced into Britain from Virginia by Sir Walter Raleigh, in 1586, though many years elapsed ere it was generally adopted in this country as an article of food. At the present day, however, not only does this root form the staple food of a large portion of the population of these isles, but wherever the British have obtained a footing on the face of the globe, there has the potato been introduced. The northern limit of the cultivation of the potato may be regarded as forming the boundary line between the agricultural occupiers of the soil and the nomadic, or wandering tribes, who derive their sustenance from the produce of the chase; for, though, beyond the region of potatoes, a few edible lichens, and some wild roots, valuable as accompaniments to animal food, may be met with, no plants occur, adapted to furnish man with a continued supply of nourishment.

A vast abundance of other plants, which, though not of equal importance with those to which we have now been

directing our attention, are highly useful in contributing to the sustenance of man, occur in various parts of the globe. To some of these we shall have occasion to refer in future pages of this work.

KEY TO THE PLATE OF

GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

MAMMALIA.

1 Orang-outan,	<i>Pithecus satyrus</i> .
2 Chimpanzee,	—— <i>troglodytes</i> .
3 Mona monkey,	<i>Simia mona</i> .
4 Striated monkey	<i>Hapale commnis</i> .
5 Chacma baboon,	<i>Cynocephalus porcarina</i> .
6 Ring-tailed macanoo,	<i>Lemur catta</i> .
7 Vampire, [†]	<i>Phyllostoma spectrum</i> .
8 Roussette bat,	<i>Plecotus timoriensis</i> .
9 Flying cat,	<i>Galeopithecus volans</i> .
10 Radiated mole,	<i>Condylura cristata</i> .
11 Lion,	<i>Felis leo</i> .
12 Puma,	—— <i>concolor</i> .
13 Tiger,	—— <i>tigris</i> .
14 Jaguar,	—— <i>onca</i> .
15 Ocelot,	—— <i>pardalis</i> .
16 Leopard,	—— <i>leopardus</i> .
17 Chetah,	—— <i>jubata</i> .
18 Lynx,	—— <i>lynx</i> .
19 Chaus,	—— <i>chaus</i> .
20 Canadian lynx,	—— <i>canadensis</i> .
21 Hyæna,	<i>Hyænis vulgaris</i> .
22 Aard wolf,	<i>Proteles cristata</i> .
23 Wolf,	<i>Canis lupus</i> .
24 Esquimaux dog,	—— <i>familiaris</i> var.
25 Arctic fox,	—— <i>lagopus</i> .
26 Jackall,	—— <i>aureus</i> .
27 Polar bear, [†]	<i>Ursus maritimus</i> .
28 Grizzly bear,	—— <i>ferox</i> .
29 Tibet bear,	—— <i>tibetanus</i> .
30 Brown bear,	—— <i>arctos</i> .
31 Glutton, or wolverine,	<i>Gulo luscus</i> .
32 Raccoon,	<i>Procyon lotor</i> .
33 Coati-mondi,	<i>Nasua fusca</i> .
34 Sea otter,	<i>Lutra maritima</i> .
35 Ermine,	<i>Mustela erminea</i> .
36 Sable,	—— <i>zibellina</i> .
37 Pine marten,	—— <i>martes</i> .

38 Civet,	<i>Viverra civetta.</i>
39 Ichneumon,	<i>Herpestes ichneumon.</i>
40 Ursine Seal,	<i>Otaria ursina.</i>
41 Fur seal,	—— <i>falklandica.</i>
42 Elephant seal,	<i>Phoca proboscidea.</i>
43 Common seal,	<i>Calocephalus vitulinus.</i>
44 Walrus, or morse,	<i>Trichecus rosmarius.</i>
<hr/>	
45 Kangaroo,	<i>Halmaturus giganteus.</i>
46 Wombat,	<i>Phascolumys fuscus.</i>
47 Flying opossum,	<i>Petaurus sciurus.</i>
48 Virginian opossum,	<i>Didelphys virginiana.</i>
64 Platypus, or duck bill,	<i>Ornithorhynchus paradoxus.*</i>
65 Spiny echidna	<i>Echidna hystrix.</i>
<hr/>	
49 Beaver,	<i>Castor fiber.</i>
50 Jerboa,	<i>Dipus jaculus.</i>
51 Chinchilla,	<i>Chinchilla lanigera.</i>
52 Grey Squirrel,	<i>Sciurus cinereus.</i>
53 Ground squirrel	<i>Sermophilus hoodii.</i>
54 Lemming,	<i>Lemmus norvegicus.</i>
55 Porcupine,	<i>Hystrix cristata.</i>
55* Brazilian porcupine,	<i>Syntheres prehensilis.</i>
56 Patagonian cavy,	<i>Dasyprocta patachonica.</i>
57 Capybara,	<i>Hydrochaerus capybara.</i>
<hr/>	
58 Sloth,	<i>Bradypus didactylus.</i>
59 Armadillo,	<i>Dasypos peba.</i>
60 Chlamyphorus,	<i>Chlamyphorus truncatus.</i>
61 Ant-eater,	<i>Myrmecophaga jubata.</i>
62 Pangolin, or manis,	<i>Manis pentedactyla.</i>
63 Cape ant-eater,	<i>Orycteropus capensis.</i>
<hr/>	
66 African elephant,	<i>Elephas africanus.</i>
67 Indian elephant,	—— <i>indicus.</i>
68 Hippopotamus,	<i>Hippopotamus amphibius.</i>
69 Two-horned rhinoceros,	<i>Rhinoceros bicornis.</i>
70 Indian rhinoceros,	—— <i>indicus.</i>
71 American tapir,	<i>Tapirus americanus.</i>
72 Malay tapir,	—— <i>malayanus.</i>
73 Peccari,	<i>Dicotyles torquatus.</i>
74 Wild boar,	<i>Sus scrofa.</i>
75 Engallo, or waart hog,	<i>Phascocochæres æliani.</i>
76 Babyroussa hog,	<i>Sus babyroussa.</i>
77 Horse,	<i>Equus caballus.</i>
78 Ass,	—— <i>asinus.</i>
79 Zebra,	—— <i>zebra.</i>
<hr/>	
80 Camel,	<i>Camelus bactrianus.</i>
81 Dromedary,	—— <i>dromedarius.</i>
82 Llama,	—— <i>glama.</i>
83 Giraffe,	<i>Camelopardalis giraffa.</i>

* The platypus and echidna have been misnumbered in Plate 5.

84 Musk,	<i>Moschus moschiferus.</i>
85 Moose deer,	<i>Cervus alces.</i>
86 Wapiti deer,	—— <i>strongyloceros.</i>
87 Rein-deer,	—— <i>tarandus.</i>
88 Chamois,	<i>Antilope rupicapra.</i>
89 Common antelope,	—— <i>cervicapra.</i>
90 Gazelle,	—— <i>dorcas.</i>
91 Algazel,	—— <i>gazella.</i>
92 Mhorr,	—— <i>mhorr.</i>
93 Gnu,	—— <i>gnu.</i>
94 Nyghau,	—— <i>picta.</i>
95 Urus,	<i>Bos aurus.</i>
96 Cape Buffalo,	—— <i>caffer.</i>
96* Common buffalo,	—— <i>bubalus.</i>
97 Bison,	—— <i>americanus.</i>
98 Musk ox,	—— <i>moschatus.</i>
99 Yak,	—— <i>gruniens.</i>
100 Ibex,	<i>Capra ibex.</i>
101 Tibet goat,	—— <i>hircus tibetianus.</i>
102 Wallachian sheep,	<i>Ovis aries strepsiceros.</i>
103 Rocky mountain sheep,	—— <i>montans.</i>
<hr/>	
104 Rytina,	<i>Stellerus borealis.</i>
105 Dugong,	<i>Halicore dugung.</i>
106 Common whale,	<i>Balæna mysticetus.</i>
107 Razor-backed whale,	—— <i>physalis.</i>
108 Spermaceti whale,	<i>Cachelot macrocephalus.</i>
109 Porpoise,	<i>Phocæna communis.</i>
110 Grampus,	<i>Delphinus grampus.</i>
111 Beluga,	<i>Delphinapterus albicans.</i>
112 Narwhal,	<i>Monodon monoceros.</i>

BIRDS.

113 Golden eagle,	<i>Aquila chrysaëta.</i>
114 Condor,	<i>Sarcoramphus gryphus.</i>
115 Vulture,	<i>Vultur fulvus.</i>
116 Lammergeyer,	<i>Gypætos barbatus.</i>
117 Secretary bird, or snake eater,	<i>Gypogeramus serpentarius.</i>
118 Virginian owl,	<i>Strix virginiana.</i>
119 Bird of paradise,	<i>Paradisea apoda.</i>
120 Grey parrot,	<i>Psittacus erythracos.</i>
121 Maccaw,	<i>Macrocerus aracanga.</i>
122 Toucan,	<i>Ramphastos pæcilorynchus.</i>
123 Passenger pigeon.	<i>Ectopistes migratoria.</i>
124 Turkey,	<i>Meleagris gallopavo.</i>
125 Superb pheasant,	<i>Phasianus superbus.</i>
126 Emu,	<i>Dromaius ater.</i>
127 Cassowary,	<i>Casuarius galeatus.</i>
128 Ostrich,	<i>Struthio camelus.</i>
129 Adjutant,	<i>Ciconia argala.</i>
130 Sacred Ibis,	<i>Ibis religiosa.</i>
131 Flamingo,	<i>Phœnicopterus ruber.</i>

132 Stormy petrel,	<i>Thalassidroma pelagica</i> .
133 Pelican,	<i>Pelecanus thajus</i> .
134 Gannet,	<i>Sula bassana</i> .
135 Southern albatross,	<i>Diomedea fuliginosa</i> .
136 Eider duck,	<i>Somateria mollissima</i> .
137 Black swan,	<i>Cygnus platoniæ</i> ,
138 Penguin,	<i>Aptenodytes patagonica</i> .

REPTILES.

139 Tortoise,	<i>Testudo mauritiana</i> .
140 Turtle,	<i>Chelonia myda</i> .
141 Gavial,	<i>Gavialis gangeticus</i> .
142 North American alligator,	<i>Crocodylus lucius</i> .
143 South American alligator,	———— <i>sclerops</i> .
144 African crocodile,	———— <i>vulgaris</i> .
145 Iguana,	<i>Iguana tuberculata</i> .
146 Chamæleon,	<i>Chamæleo vulgaris</i> .
147 Surinam toad,	<i>Pipa surinamensis</i> .
148 North American frog,	<i>Rana pipiens</i> .
149 Boa constrictor,	<i>Boa constrictor</i> .
150 Rattlesnake,	<i>Crotalus horridus</i> .
151 Cerastes,	<i>Vipera cerastes</i> .
152 Cobra di capello,	<i>Coluber naia</i> .

FISH.

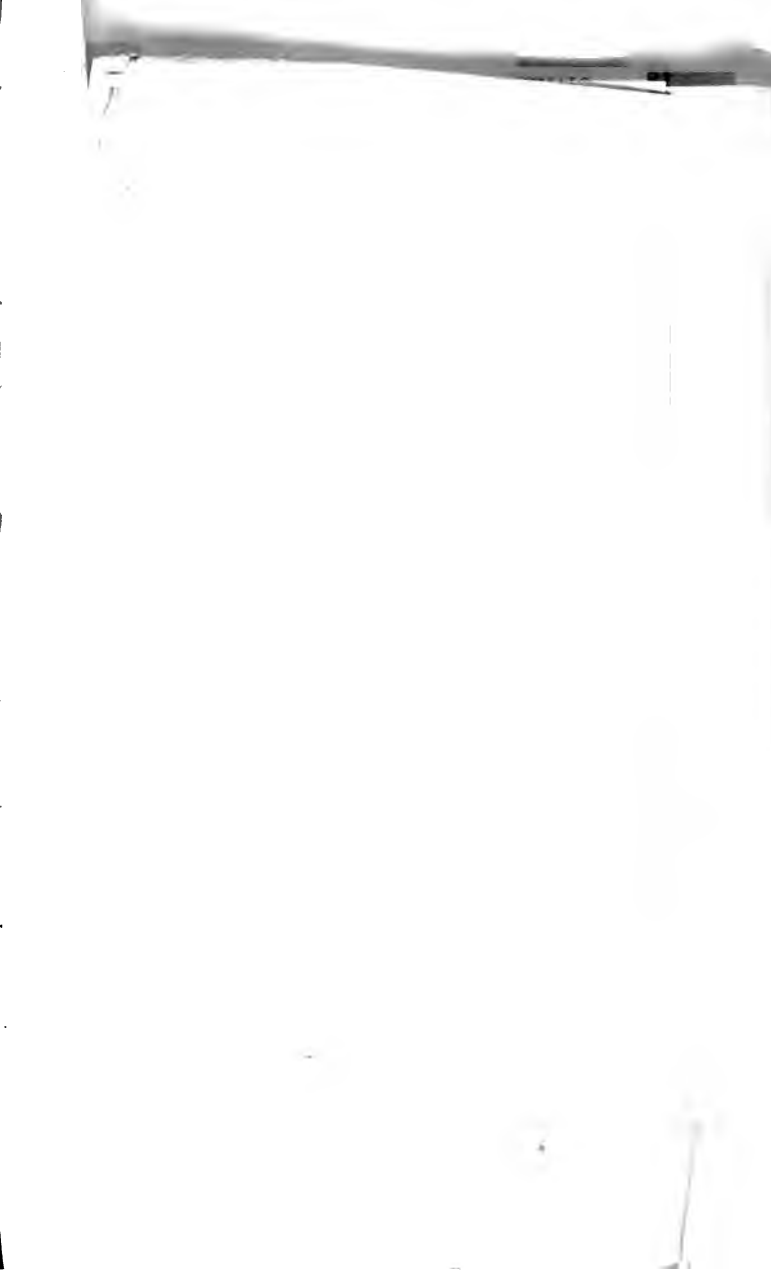
153 Shark,	<i>Scyllium commersonii</i> .
154 Sword fish,	<i>Xiphias gladius</i> .
155 Sturgeon,	<i>Accipenser huso</i> .
156 Electric eel,	<i>Gymnotus electricus</i> .
157 Torpedo,	<i>Torpedo narke</i> .
158 Chetodon,	<i>Platax vespertilis</i> .
159 Saw fish,	<i>Pristis antiquorum</i> .
160 Cod,	<i>Gadus morrhua</i> .
161 Porcupine fish,	<i>Diodon hystrix</i> .
162 Flying fish,	<i>Exocoetus exilis</i> .
163 Cape pike fish,	<i>Tetrapterus herschellii</i> .
164 Herring,	<i>Clupea harenga</i> .
165 Salmon,	<i>Salmo salar</i> .
166 Turbot,	<i>Rhombus vulgaris</i> .
167 Leafy sea-horse,	<i>Hippocampus foliatus</i> .

ARTICULATED ANIMALS.

168 Lobster,	<i>Astacus marinus</i> .
169 Centipede,	<i>Scolopendron morsitans</i> .
170 Scorpion,	<i>Scorpio gigas</i> .
180 Locust,	<i>Acridium cristatum</i> .
181 White ant,	<i>Termites fatatis</i> .

MOLLUSCOUS ANIMALS.

171 Cuttle fish, or sepia,	<i>Loligo octopus</i> .
172 Northern clio,	<i>Clio borealis</i> .
173 Paper nautilus,	<i>Argonauta argo</i> .



174 Common nautilus,	<i>Nautilus pompilius.</i>
175 <i>Bulinus</i> , or <i>Bulimus</i> ,	<i>Bulimus rosaceus.</i>

RADIATED ANIMALS.

176 Star fish,	<i>Asterias glacialis.</i>
177 West Indian coral,	<i>Madrepora muricata.</i>
178 Isle of France coral,	———— <i>abrotenoides.</i>
179 Cup-shaped pin sponge,	<i>Raphiophora patera.</i>

CHAPTER VIII.

GEOGRAPHICAL DISTRIBUTION OF ANIMALS.

Ye blessed creatures, I have heard the call,
 Ye to each other make ; I see
 The heavens laugh with you in your jubilee ;
 My heart is at your festival,
 My head, too, hath its coronal,
 The fulness of your bliss I feel—I feel it all.

WORDSWORTH.

MULTIFARIOUS as are the known vegetable productions of the earth, its animated inhabitants are greatly more numerous, almost every portion of the globe teeming with living creatures.

..... Nor is the stream
 Of purest crystal, nor the lucid air,
 Though one transparent vacancy it seem,
 Void of the unseen people.

The geographical distribution of animals, like that of plants, appears to depend partly on temperature and climate, and partly on local causes. Animals, also, like plants, have their natural stations and habitations, though these are not always capable of being so rigorously determined as those of the latter. Some, however, are remarkably local. Thus, the *mydaus meliceps*, or badger-headed mydaus, an animal intermediate in character between the badger and polecat, and which is an inhabitant of Java, "is confined exclusively to those mountains in that island which have an elevation of more than 7000 feet above the level of the sea ; and on these it occurs with the same regularity as many plants."

Noxious as are some species of animals to us, and insignificant as many of the inferior tribes may appear, they all act their appointed part in the economy of nature, fulfilling the offices assigned to them by the Creator. Man is apt to regard good and evil so entirely as it has reference to himself, and is subservient to his own convenience, that he not unfrequently overlooks the general amount of happiness which the beneficent Author of Nature appears to have had in view in the creation of animated beings. He too much considers the world as made for him, and for him alone; and, accordingly, too often regards all things that are not conducive to his pleasure or benefit, either as useless or noxious. "We complain," says Paley, "of what appears to us the exorbitant number of some troublesome insects; not reflecting that large portions of nature would be left void without it. What we term blights are oftentimes legions of animated beings, claiming their portion of the bounty of nature."

In the animal, as well as in the vegetable kingdom, the largest proportion of species occurs in the warm regions of the globe, and a gradual decrease in the number both of genera and species is observable as we recede from inter-tropical countries. This decrease is very striking in the *radiated animals*, the greater number of which are inhabitants of the ocean. In cold latitudes, the *cellariæ*, and *sertulariæ*, with a few sponges, *alcyonia*, and *asteriæ*, are alone to be met with. In proceeding towards the equator, when we arrive at the forty-fourth or forty-fifth degree of north latitude, their number increases, and *gorgoniæ*, sponges with loose tissues, and *millepores*, appear in profusion. A little farther, and the coral reddens the depths of the ocean with its brilliant branches; Sicily, in particular, having been long famed for its fisheries of the true red coral. This is soon followed by the large *madrepores*. It is not, however, until we approach the thirty-fourth parallel of latitude, that the radiated animals become developed to any great degree in the northern hemisphere; and it is chiefly within the tropics, that these animals, some of which are scarcely visible to the naked eye, perform the important offices allotted to them in the field of nature; lending their aid in the construction of those vast reefs, which

either form additions to already existing land, or constitute new islands.*

The *flustræ*, however, do not appear to be restricted by climate, but abound in every sea, occurring in profusion on the sea-shores, being usually found attached to the fuci thrown up from the depths of the ocean; some of these *flustræ* appearing like spots of a chalky substance on the sea-weed, whilst others, of a light fawn colour, and spreading like leaves, might almost be themselves mistaken for sea-weed. The *ser-tulariæ*, which also abound on our shores, likewise present arborescent forms; and some species are very beautiful.

Radiated animals are met with in considerable numbers in the Mediterranean Sea, and the sponge of commerce is principally obtained from the Greek islands. But perhaps few parts of the ocean afford the spectacle of a more striking assemblage of these animals, than the bed of the Red Sea; every part being covered both with sub-marine plants, and with various species of *polyparia*, the whole "presenting the appearance of a submarine garden of the most exquisite verdure, enamelled with animal forms."

There, with a light and easy motion,
The fan-coral sweeps through the deep clear sea,
And the yellow and scarlet tufts of ocean
Are waving like corn on the upland lea,
And life in rare and beautiful forms
Is sporting amid those bowers of stone.

Animals belonging to the class *Mollusca* are also more numerous in species, and more remarkable for their size and beauty in the hottest regions of the globe, than in cold and temperate latitudes; and, when instances occur of similar species inhabiting different zones, we find that the individuals met with in countries nearer the equator, are of larger dimensions than those which are natives of colder climates. Gene-

* Let us not, however, be misunderstood; these animals are passive rather than active agents in this wonderful work. They do not, like the bee when forming a honey-comb, actually toil and collect materials for the construction of the coral; that substance being in fact formed by secretions from the body of the animal, and other processes, in a manner analogous to the formation of the shell of a whelk, or other mollusk, and constituting, like that, the protection and habitation of the animal.

rally speaking, however, the species differ, even where the genera agree; of this, the beautiful volute shells, which are dispersed over nearly all the temperate and warm regions of the globe, may form an instance. Thus, the *voluta olla* is found in Spain; the *voluta cymbium* in Africa; *voluta tesselata*, and other species, in India; *voluta Braziliensis* in South America; and *voluta umbilicata* in Australia. Twenty-four species of shells are, however, known to be common to the European and American coasts of the Atlantic.

The *sepia*, or cuttle fish, of our shores, are animals of singular, but not of formidable, aspect. In the Mediterranean Sea, they attain a great size: and Mr. Swainson mentions having seen one off the coast of Messina, whose arms were thicker than the wrist of an ordinary man; but the most enormous cuttle-fish are those inhabiting the Indian Seas (fig. 171), where they are of sufficient size to attack the pearl divers, whom they seize and entangle in their "arm-like feet." Among the northern molluscs, the most worthy of notice is the *clio* (fig. 172), remarkable for the enormous swarms in which it occurs, and from its constituting the principal food of the whale. The *trepang*, *beche de mer*, or sea-slug, is another singular molluscous animal, which appears to be confined to the shores of the Indo-Chinese countries, the Indian Archipelago, and Australia.

The marine shell-fish, or testacea, of Northern Europe, are not distinguished for their variety or splendour; but the Mediterranean Sea, although many of its species are similar to those occurring in the British seas, affords others bearing a strong affinity to the species met with in the Red Sea, on the north-western coasts of Africa, and even in the Indian Ocean. The conchology of the Indian seas is the most splendid, profuse, and varied, of any division of the globe. There we meet with the *conus*, *oliva*, *voluta*, *harpa*, *cyprea*, *mitra*, and many other of the most valued shells. The bivalves, also, though less numerous, include some very remarkable species, such as the *malleus*, or hammer-shaped oyster; and the *tridacna gigas*, the largest known bivalve, the shell of which sometimes measures four feet in length, the whole animal being of the enormous weight of five hundred pounds. Africa also

ranks among its shells some beautiful cones, volutes, olives, &c. The marine conchology of the West Indies and America is very deficient in species, when compared with that of Asia in similar latitudes. America, however, perhaps exceeds the other divisions of the globe in its fluviatile, or fresh-water shells; and the southern part of the continent contains some very remarkable land-shells of the *bulimus* kind (fig. 175), which are met with in the forests, and frequently exceed four inches in length. The shells of the Austral Ocean rank next in splendour to those of the Indian seas. The snow-spot volute, and some other rare species, are peculiar to this region, and the particularly beautiful shells called *phasianellæ*, or pheasant snails, are principally confined to Australia.

Among the animals of the class *Articulata*, we find some genera belonging to the family crustacea very generally diffused. Thus, crabs of various species appear to occur in almost every part of the globe. Some articulated animals, such as the spider and the centipedes, or scolopendra (fig. 169), attain a much larger size, and present a far more formidable appearance in the hottest regions of the globe, than with us; and the most venomous of the class, the scorpion (fig. 170), though it has been met with in southern Italy, yet appears in its most dreaded form in intertropical countries. Among the articulated animals possessing the most general interest, are, however, the insect tribes, and to these we shall accordingly give a rather more lengthened consideration.

Insects, by their number, and the variety of their powers and instincts, exercise great influence in the economy of nature. A small number of species, including the bee, silkworm, cochineal insect, &c., are of direct utility to man; and a far greater number indirectly promote his benefit. Among the latter, are all such as destroy animal and vegetable substances in a state of decomposition: substances which, were they suffered to remain, would taint the air. Such insects, also, as prey on other noxious tribes, and are thus instrumental in keeping them within due bounds, may be considered as

indirectly useful. Many other instances might be adduced, but these will suffice us for examples.

Although the stations of insects are less determined than those of plants, and it would be difficult to assign any precise limits to some species, yet, in taking a general view of the insect tribes, the following division into ten stations forms a convenient arrangement.

1. *The sea*.—A very limited number of species belong to this station; the insects frequenting the waters of the ocean, even in their perfect state, are few in number; and not one species is known which passes all its changes in the sea.

2. *The shores of the sea*.—The number of species inhabiting the shores of the sea is far greater, especially in warm countries, which are usually rather rich in species peculiar to this station.

3. *Brackish waters*.—Brackish waters have their peculiar species, which ascend the sides of rivers as far as the tide extends.

4. *Fresh water*.—Where the preceding species are lost sight of, others make their appearance, and these never quit the vicinity of fresh water. Among the fresh-water species, some only continue in their watery abode in their earlier states, and live there completely immersed; others pass their whole lives in the water. The latter, however, sometimes leave their watery abodes for a short time, usually at the approach of night. Some aquatic insects live only in marshes, ponds, and stagnant pools, whilst others prefer running water. Some insects are peculiar to the margins of fresh water. These again differ with the soil; some choosing a sandy, some a stony, or gravelly, and some a muddy soil.

5. *The various kinds of soil*, according as they are dry or moist, cultivated or uncultivated, rocky, sandy, compact, light, &c., have each their appropriate insects, which either inhabit the surface, or the interior.

6. *Mountains*.—The declivities of mountains afford numerous stations for insects. The species which inhabit the more elevated parts are called *alpine*; and those whose range is confined to the lower declivities, are termed *subalpine*.

7. *Living vegetables*.—Certain insects seem to delight only

in extensive forests, and some species live upon the leaves, and never alight on the earth, except accidentally; others frequent heaths, pathways, and clearings in the wood, without ever resting upon leaves. Some prefer cultivated fields, dry meadows, coppices, or gardens; others, again, are confined to dry salt marshes. Each species is attracted to these different places, not only by the plants which serve it for food, but by certain conditions of heat, light, and humidity. Every part of a plant—its blossom or fruit, its leaves, stalk, root—is liable to be attacked by particular species of insects, to which this part serves as a station.

8. *Dead or decomposed vegetables* form the station of a great multitude of different kinds of insects, especially in their early states.

9. *Living animals* (particularly mammiferous animals and birds) form the station of some insects; and

10. *Dead animals* constitute the station of others.

These stations are not, however, at all times peopled by *perfect insects*; for although the animals may be found in one or other of their early states of *egg*, *larva*, or *pupa*, these stations, at certain seasons of the year, present an almost entire solitude as regards the former.

Every species of insect has its determined regular periods for appearing in the perfect form. These periods may be retarded or accelerated by the effect of temperature (as, for instance, by a cold or a warm spring); but these are only slight variations from the general rule; and it may be regarded as an established law, that in all parts of the globe the appearance of insects is intimately connected with that of vegetation.

In our temperate regions, the months of April, May, and June, are the seasons when insects are in the greatest abundance: a remarkable coincidence existing between the appearance of the insect, and the plant which is to afford it food. The number of these animals diminishes in the heat of summer; but in September and October, an augmentation again occurs, which corresponds with the flowering of certain autumnal plants. On the arrival of winter, no inconsiderable number still exist, concealed in their various retreats, and ready to

make their appearance on warm and sunny days, whilst a few species continue to frequent our gardens to the close of the year, and some are seen even on the snow itself.

Winter, in our climates, by arresting vegetation, and depriving insects of their means of subsistence, divides the year into two very distinct periods. In equinoctial regions, where winter is unknown, vegetation never being suspended, but where the year is more or less divided into two seasons, the wet and the dry, the latter season has nearly the same effect on insects that winter has with us—they almost entirely disappear, and are not again visible until the rains commence. When the rainy season is at its full height, it however proves nearly equally destructive to these animals; and these different seasons, at the same time, produce marked effects on the plants which constitute the food of the insect tribes.

The number of different species of insects actually preserved in cabinets is supposed to amount to at least 80,000; and when we consider the difficulties attending the collection of many species, and the numerous regions still entomologically unexplored, we cannot but conclude that a vast proportion must be still unknown to Europeans.*

The amount of species in any particular region or country depends greatly on its temperature, moisture, and the nature of its vegetation; as also on the absence or presence of barriers, (such as a ridge of mountains, or an expanse of water) separating it from neighbouring countries. The general result is similar to that already spoken of with regard to vegetables, namely, that the number of species decreases as we recede from the equator and approach the poles. This will, of course, be subject to local variations, arising from local peculiarities.

The globe has been divided into six entomological regions, according to the profusion or poverty of species:—

1. The first includes tropical America; and among the countries which it contains, Brazil stands pre-eminent, Mexico is the next in order, and after these, Guiana and Colombia.

2. The Isles of Sunda, the portion of the Asiatic mainland

* The *probable* number of species of insects existing on the whole globe has been estimated at from 380,000 to 360,000.

situated in their vicinity, the Island of Madagascar, Cafraria, and the eastern coasts of intertropical Africa, rank next in profusion of species, and constitute the second region.

3. The third region embraces a large portion of Europe, including also the African and Asiatic shores of the basin of the Mediterranean. Among the countries belonging to this region, Germany appears to hold the first rank.

4. North America, which forms the fourth region, seems to be much less prolific in species than Europe in the same latitudes.

5. The fifth region comprehends the arid and sandy districts of the globe, lying within or near the tropics ;—Northern Africa, Chili, Peru, and perhaps, some of the plains of Asia. Australia may also be included in this region, though the last in order.

6. The sixth region, and the lowest in this comparative scale, is formed by the Polar regions. No true insect has been discovered in Spitzbergen, and, even in Novaia Semlia, or Nova Zembla, only ten species are known.

Some insects are very local, whilst others are common to remote countries, separated by apparently almost impassable



Painted Lady Butterfly.

which seek their food from the ground, for the latter probably rarely wander out of soundings, or approach the mid seas; whilst the former, some of which roam from one side of the Atlantic to the other, or inhabit only the middle of that ocean, belong as much to the New as to the Old World. Some species of fish, however, appear annually to migrate from the deeper and less accessible parts of the ocean,* and approach the shallow shores, for the purpose of depositing their spawn among the marine plants which fringe the coasts.

Perhaps the most universally diffused fish are the perch family, and the salmon and trout family, some species of which appear to have been met with in almost every part of the globe. But in these, as in most other cases, although the families have their representatives, and the genera may frequently agree, the species differ. The *salmo salar* (fig. 165), however, is considered to inhabit both sides of the Atlantic. This family of fish, whilst it occurs in the waters of tropical America, includes also the most northerly of fresh-water fish; and the Alpine trout of Nova Zembla is often caught in immense quantities, and exported to distant countries. The sturgeon (fig. 155) is met with in Europe, Asia, and North America, but the species differ in different regions; Western Europe contains only one species, whilst North America, and particularly the river Mississippi and its tributaries, present numerous and varied species. The cod and whiting family occupy the northern parts both of the Atlantic and Pacific Oceans, and some species, among which is the *gadus morhua*, or common cod (fig. 160), are considered to extend over the whole range. Fish of the sole kind are also met with on both sides of the Atlantic; the identity of species has not, however, been satisfactorily ascertained. The herring family (fig. 164) has a considerable range, similar species, in some instances, apparently extending to both con-

* This periodical approach of some fish to shallow water, accounts for the occasional appearance off our coasts of some species, such as the cod and haddock; and a recent author has even attributed the migration of the herring to a similar cause, supposing that the fish appear off the coasts, sooner or later, in accordance with the climate; this, however, seems to require confirmation.

tinents. The mackerel makes its appearance periodically on the western coast of Africa, and also in New Zealand, as well as on our own shores, though probably not of similar species. The mullets do not extend their range across the Atlantic, but some species have a considerable range from north to south; thus, one species is met with from Norway to the Mediterranean, and another extends its range from the Brazils to New York.

The shark of "horrid jaw" (fig. 153) is very generally diffused over the seas of warmer latitudes, and appears, like most other animals of a ferocious nature, to be larger and more powerful in the hotter regions of the globe, than in its more northern range. The sword fish (fig. 154) inhabits the Mediterranean, and perhaps extends its range to the coasts of America. The family of sauroid fishes of the present day contains only two genera, one of which is peculiar to Africa, and the other to America. The saw fish (fig. 159) is an inhabitant of the Atlantic Ocean, extending its range across the whole expanse of waters. The chetodon family (fig. 158) mostly inhabit the Indian and Polynesian seas, though one species frequents the coasts of Europe, and some species are met with on the coasts of America. The porcupine fish (fig. 161), and the family to which it belongs, are chiefly confined to the warmer seas. The Cape pike fish (fig. 163) is an inhabitant of the coasts of Southern Africa. The family of flying fish (fig. 162) are met with in all tropical seas, in the Atlantic as well as in the Pacific, and extend their range northwards, in the former, as far as New York, and to equally high latitudes in the latter. The most northern known fish is the *zoarces polaris*, which has been taken within nine degrees of the north pole.

Dr. Richardson mentions that some of the American fish have the power of making a singular noise; several kinds of fish, vulgarly called "grunts," being met with, which possess this faculty in an extraordinary degree. Some of these fish make this remarkable grunting noise whilst in the water, but others seem to make it only when handled. The former sound has been supposed to be connected with the cavernous recesses in the skulls of the fish which possess this power; and the

latter to be occasioned by the sudden escape of a quantity of air from their gills. Dr. Richardson mentions another peculiarity in some fish, occurring off the American coast. "Every mariner," he observes, "who has anchored early in the spring on the coasts of South Carolina, Georgia, or Florida, must have been annoyed by a drumming noise, produced in the night, apparently on the bottom of the ship, and loud enough to deprive a stranger of rest. This noise is said to be caused by a fish, of about six pounds' weight, beating its tail against the vessel, to relieve itself from the pain caused by multitudes of parasitic worms which infest its body."

Reptiles are divided into two classes, *reptilia* and *amphibia*. The *reptilia* include the *chelonians*, or tortoises and turtles; the *saurians*, or lizards and crocodiles; and the *ophidians*, or serpents. The *amphibia*, called also *batrachians*, include frogs, toads, salamanders, &c.

The intertropical regions present us with the largest and most venomous of the *reptilia*; and a gradual diminution in their number, size, and in the virulence of their poison, is observable as we approach the colder latitudes, until at length they totally disappear. Reptiles appear to be more numerous in tropical America than in any other part of the world; and even in North America, they occur in much greater variety and abundance than in Europe. But, although the Old World possesses fewer species than the New, reptiles are found to have a more northerly range in that division of the globe than in America. Thus, the most northerly known range of the emys, or fresh-water turtle, in America, does not extend beyond the fiftieth parallel of latitude; but the European emys is found some degrees further north, in Prussia. In America, the most northern limit of lizards is also the fiftieth parallel; but it will be evident, that they extend considerably farther to the north in Europe, for they are by no means uncommon in our own island, and are even met with in Sweden. The serpent tribe swarm in the equatorial districts of America; but disappear on the declivities of the Andes, at the elevation of 6000 feet above the sea; and their extreme northern limit in

that continent is the fifty-fifth parallel; whilst in Europe a small species of serpent is met with in Norway. This difference in the range of animals of this description, appears to arise from the diversity of climate in Europe and America; for though the hot summers of the latter region are favourable to their development, serpents are probably not adapted to endure the severe and long-continued winters experienced in the more northern parts of Eastern America.

With the exception of one or two species of sea-turtles, not any animals included in the *Reptilia* class appear to be common to both continents. Thus, among the crocodile family we find the gavial, or garial (fig. 141), peculiar to India; the African crocodile (fig. 144), the largest of the tribe, peculiar to Africa; the North American alligator (fig. 142), to Georgia and the banks of the Mississippi; the West Indian crocodile, to the West Indies and the lowlands of Central America; and the South American alligator, or cayman (fig. 143), to the warm moist regions of South America. The chameleons (fig. 146) are peculiar to the Old World, being met with in Syria and other parts of Asia, and also in Africa, in some parts of which region almost every shrub is said to be covered with them. The iguanas (fig. 145), on the other hand, are all natives of the New World. Among the serpent tribe, again, we find the same difference of species in the different regions of the globe: the python of India, though nearly allied to the boa constrictor (fig. 149) of America, being a distinct species; whilst the cobra di capello, or hooded snake (fig. 152), is peculiar to Asia; the cerastes (fig. 151) to Africa and the adjacent parts of Arabia; and the rattle-snake (fig. 150) to America.

The *amphibia*, or frogs, toads, salamanders, &c., are more capable of enduring the extremes of temperature, than the true reptilia; and accordingly, their range is greater, and although they are largest and most numerous in the warm regions of the earth, they also exist in high and cold latitudes. Thus, frogs and salamanders are met with on the River Mackenzie, in the sixty-seventh parallel of latitude, where the mean annual temperature is not above seven or eight degrees of Fahrenheit; and where, in winter, the cold sometimes descends to ninety

degrees below the freezing point, or fifty-eight below zero; and in other parts of North America, the pools of melting snow swarm with very noisy frogs, long before the soil is thawed. No animal of this class appears to exist in Nova Zembla, a circumstance probably attributable rather to the deficiency of summer heat, and the absence of suitable food, than to the severity of the climate. The genera of frogs, toads, and salamanders, are generally diffused both in the Old and New World, but the genus *siren* appears to be peculiar to America; though a near approach to it is considered to exist in the singular animal called the *proteus anguinus*, which inhabits some of the lakes of Carniola.

Come, all ye feathery people of mid-air,
 Who sleep on rocks, or on the mountain summits
 Lie down with the wild winds; and ye, who build
 Your homes amidst green leaves by grottoes cool;
 And ye, who on the flat sands hoard your eggs
 For suns to ripen; come! PROCTER.

Birds, like all other orders of animals, have their natural geographical limits; and although much general correspondence of form is observable in parallel zones, both among aquatic and terrestrial birds, yet, in some instances, we find whole families confined to particular regions. Thus the humming birds are peculiar to the New World, whilst the scarcely larger and equally beautiful sun birds, belong to Africa; and the birds of Paradise are confined to New Guinea and some of the adjacent islands. In other instances, we find families of birds very widely diffused, but the genera differing in different regions. Thus, the African ostrich is confined to Africa, the *rhea Americana*, or American ostrich, to South America, and the emu to Australia. The *columbidae*, or pigeon family, are spread generally over the world, some species having been met with in almost every land that has been visited by Europeans; but this family contains several well marked minor geographical groups, and the species are very numerous. The grouse family is likewise widely diffused, though chiefly in the cold and temperate regions; and among these, three species of

ptarmigan, which inhabit the most northern districts, are common to both the Old and New World.

The ptarmigans are, however, by no means the only species of birds common to both continents, for a great similarity exists between the ornithology of Europe and that of North America, not only in genera, but in species; a third part of the North American species being also inhabitants of Europe. "As the food of the raptorial order of birds" (eagles, vultures, falcons, owls, &c.), observes Dr. Richardson, "must be everywhere very similar in quality, it excites no surprise when we discover that many species are common to different quarters of the world, especially among those groups which prey on quadrupeds and birds, taking them alive. But we are led to expect that the distribution of birds which feed on the fruits of the earth should be influenced in a greater degree by climate, soil, and consequent fertility of the land; and as temperature, moisture, and richness of vegetation have a manifest connexion with the abundance and variety of insects, we look to find the insectivorous birds of the several continents nearly as different as their floras." These remarks of Dr. Richardson are confirmed by his researches; for it appears that, among the land birds of the Old and New World, by far the greatest number of identical species occur among the rapacious tribes. Thus, we find a large proportion of the owls and falcons common to both continents; some of the latter, indeed, appearing to be inhabitants of the whole globe. With the vultures, however, the case is different; no species being common to the Old and New World; and the range of the vulture tribe is by no means so extended as that of the owls and falcons, vultures being most numerous in the intertropical regions. "Indeed," says Dr. Richardson, "as their food is carrion, their utility in the economy of nature is obviously greatest in the warmer latitudes, where they accordingly abound." The most northerly range of the vulture in Europe, is the fifty-first degree of latitude, though a species of vulture has been occasionally seen in England; in America, these birds reach the fifty-fourth parallel. The magpies and carrion-crows of Europe and America appear to be identical species: and the raven is common to Europe, Asia, Africa, and America. But it is among the wading and

swimming birds, such as the cranes, coots, &c., and the swans, geese, &c., that we meet with the greatest number of species common to both continents; and indeed our well-known wild goose is said to extend its range in America, from Hudson's Bay to South Carolina; and in the Old World, to be met with from Lapland to the Cape of Good Hope, and to be frequent in Arabia, Persia, China, and Japan.

Our special little favourite, the redbreast,

The Thomas in Finland,
And Russia far inland;
The Peter of Norway boors;
Our little English Robin;

appears to be common to every part of Europe, from Spitzbergen to the Mediterranean Sea. It is also found in the woods of North America; but whether an aboriginal native of those regions, or introduced by the settlers, may be doubtful. The common sparrow is very generally diffused over the northern hemisphere; but it is said to have followed the progress of cultivation and the introduction of corn into Russia. The chimney, or barn-swallow, occurs both in the Old and New World; and the well-known cuckoo is common to Europe, and to the highlands of Central Asia, where its familiar note has cheered many a distant traveller, and recalled home to his imagination. The migratory habits of the cuckoo, as well as those of many other species, such as the swallow, black-cap, &c., greatly extend their range of latitude, though not of climate, for the wonderful instinct by which they are guided, and their powers of locomotion, enable them to enjoy a perpetual summer. In all cases, however, these migrations do not appear to be regulated by change of temperature, and the failure of food; but to be dictated by the yet more remarkable instinct with which they are endowed, and which leads them to seek some particular kind of nutriment for rearing their young.

Mammiferous quadrupeds also occur in the greatest number and variety in the hottest regions of the globe, and a gradual decrease in their number takes place as we recede from the

torrid zone. Many of the quadrupeds of intertropical regions are likewise distinguished for their size, for their amazing strength, or for the ferocity of their dispositions. Like all other classes of animals, the terrestrial mammalia of the Old and New World differ considerably. Thus, the apes and baboons (figs. 1, 2, 5) the lion (fig. 11), the tiger (fig. 13), the elephant (figs. 66, 67), hippopotamus (fig. 68), rhinoceros (figs. 69, 70), horse (fig. 77), ass (fig. 78), camel (figs. 80, 81), giraffe (fig. 83), buffalo (fig. 96), and numerous other genera of mammalia, belong exclusively to the Old World; and when America was first explored, its quadrupeds were found to be dissimilar to those previously known to its discoverers; and their surprise and admiration were excited by the new forms presented to their eyes. Such were the puma, or cougar (fig. 12), the jaguar (fig. 14), the capybara (fig. 57), sloth (fig. 58), armadillo (fig. 59), ant-eater (fig. 61), the tapir (fig. 71)*, peccari (fig. 73), and the llama (fig. 82). Another most singular assemblage of animals presented itself to the discoverers of Australia, even more peculiar to that particular region, and, generally speaking, differing widely from the fauna of any other portion of the globe. The islands of the Indian Archipelago usually contain species similar or nearly allied to those found in India, China, or the Indo-Chinese provinces, but it is mentioned by Sir J. Brooke, that though the elephant, rhinoceros, and leopard, occur in Borneo, they are only found in the most northern parts of that island, and that this appears to form their extreme eastern range, these animals not being met with in any country in the archipelago to the eastward of this longitude. The whole Polynesian Archipelago is almost destitute of terrestrial mammalia.

The class Mammalia is divided into nine orders:—1. *bi-mana*; 2. *quadrumana*; 3. *carnivora*; 4. *rodentia*; 5. *eden-tata*; 6. *marsupiata*; 7. *pachydermata*; 8. *ruminantia*; 9. *cetacea*.

The order *Quadrumana* includes all animals whose hinder extremities are furnished with hands instead of feet, such as apes (figs. 1, 2), baboons (fig. 5), monkeys (figs. 3, 4),

* The Malay tapir was unknown in Europe, until a much more recent period.

macaunos, or lemurs (fig. 6), &c. Quadrumanous animals inhabit chiefly the forests of tropical countries, where they are very numerous; one species extends into Europe, a species of monkey being found in the neighbourhood of Gibraltar; this is, however, where

Europe and Afric on each other gaze.

The apes and baboons, as has just been remarked, are peculiar to the Old World; and we find the hapales (fig. 4), and other American quadrumana, distinguished from those of the Old World by a remarkably broad and flat nose, and by the absence, or inefficient smallness, of the thumb of the fore-hand. The sapajous, and some other species which inhabit the New World, have, however, this deficiency compensated by the addition of a *prehensile* tail, by which these animals are enabled to cling to the branches of the lofty trees of the South American forests; their four hands, at the same time, being still at liberty for other purposes, so that their tail almost performs the part of a fifth limb.

The order *Carnivora*, or *carnivorous animals*, which includes all the mammalia that subsist wholly or partly on animal food, is subdivided into three families:—1. *cheiroptera*; 2. *insectivora*; and 3. *carnivora*. The *cheiroptera* are distinguished by a fold of skin connecting the sides of the neck with all the limbs, and with the fingers of the anterior pair. This family includes bats, and flying-cats. Some species of bats are very extensively diffused, but others have a very limited range. The roussettes (fig. 8), which inhabit the Indian Archipelago and Madagascar, feed chiefly on fruits: whilst the vampires, or blood-sucking bats (fig. 7), are all peculiar to the hot regions of America. The flying-cats, or (as they are sometimes called) flying-foxes (fig. 9), appear to be confined to the Islands of the Indian Ocean, and to the northern parts of Australia. These very singular creatures are the only mammiferous animals met with in the Moldivas, where they are very numerous and large, being about the size of a full-grown cat, and may be seen flying about all day long. They are said to be very destructive to the small cocoa-nuts.

The *insectivora*, or carnivorous animals feeding on insects, include the hedgehogs, shrews, and moles (fig. 10.) The animals of this family are more than usually restricted within narrow geographical limits; and the North American species differ greatly from those of Europe. Some species are met with in the East Indies, in Madagascar, and at the Cape of Good Hope, but South America is singularly deficient in animals of this family.

The *carnivora*, or carnivorous animals more especially distinguished by that appellation, include lions, tigers, dogs, wolves, foxes, weasels, bears, badgers, seals, the walrus, &c. This family is subdivided into three tribes:—1. the *plantigrada*, or animals which walk on the entire soles of their feet, such as bears; 2. *digitigrada*, or animals which walk on the end of their toes, such as the lion; 3. *amphibia*, or animals having their feet furnished with webs, which adapt them for an aquatic life.

Among the *plantigrada*, are bears (figs. 27, 28, 29, 30), badgers, and gluttons (fig. 31). The *ursine*, or bear kind, which are generally animals of a surly and savage disposition, inhabit both the Old and New World; and though the species differ, the genera mostly agree. The maritime or polar bear is, however, common to all the northern regions of the globe, traversing the whole of the icy seas from Nova Zembla and Spitzbergen to Greenland, and from thence along Arctic America to the shores of Siberia. This animal has the most northern range of any quadruped, and has been seen by Sir Edward Parry in lat. 82°, but it descends on the Labrador coast as far south as lat 58°. The glutton, considered identical with the wolverine of America, inhabits the more northern regions of both continents, ranking in this respect next to the polar bear and the Arctic fox.

Animals of the *digitigrada* tribe are again subdivided into the *vermiform* (so called from their elongated form), the *canine*, and the *feline*. The *vermiform* comprehend weasels (figs. 35, 36, 37,) civets (fig. 38), ichneumons (fig. 39), &c. The weasel kind, including the ermine, sable, &c., are mostly inhabitants of the more northern districts of both continents; whilst the civets, genetts, and ichneumons, are natives of the warmer

regions of the Old World. The second division includes jackals (fig. 26), wolves (fig. 23), foxes (fig. 25), and dogs (fig. 24). The wolves of America are distinct from those of the Old World; but a general likeness prevails in the physiognomy of each group, however the species may differ in size, colour, or habits. Foxes are very generally diffused, some species being peculiar to the Old World, and some to the New. The Arctic fox, though an inhabitant of Europe, extends its range, like the polar bear, into the New World, frequenting the Arctic coasts of America as far as Mackenzie's river; whilst another equally northern species, the isatis, is said to be an inhabitant of the Western districts of North America, and to extend into Siberia. The dog, of which there are innumerable varieties, appears to be a native of the northern temperate zone.

Animals of the feline kind are very generally spread over both the Old and New World, though, with the exception of the pee-shew, which is an inhabitant of the northern parts of both continents, all the species differ. The largest and most ferocious animals of the feline kind inhabit the hottest regions of the earth. And although the geographical range of the lion and tiger on each side of the equator is considerable, these animals attain a far greater size near that line, than they do at their utmost northern and southern limits. Africa is the abode of the royal lion; the species which inhabits India, and some other parts of Asia, being smaller, and nearly destitute of a mane. The tiger (fig. 13) is peculiar to Asia, being more especially abundant in India, and in some of the Asiatic islands. It however extends its range as far as Chinese Tartary; and a smaller species, or probably variety, is mentioned by Tournefort as inhabiting Mount Ararat, the sides of which it ascends almost to the verge of the snow-line. Africa is the country of the leopard (fig. 16) and panther, which are very numerous in that division of the globe; where we also meet with the hyæna (fig. 21) in considerable abundance. The leopard and panther, however, and some of the hyænas, extend their range into Asia, in which region we also meet with the chetah, or hunting leopard (fig. 17), and several smaller animals of the feline tribe.

Not any of the animals we have now enumerated are found in the New World, but animals of the lynx kind (figs. 18, 19, 20), though of distinct species, occur in both continents. America, however, is not without its appropriate feline inhabitants, the puma, or cougar (fig. 12), being peculiar to that continent. This animal, which is common to both North and South America, is not unfrequently erroneously called the American lion, though in fact it bears little resemblance to that animal. The jaguar (fig. 14), also peculiar to the New World, is equally erroneously, and even more generally, designated as the panther, an animal unknown in that continent.* The ocelot, or cat-a-mountain (fig. 15), is another South American species, and extends its range northwards into Mexico. Wild cats of different species occur in almost every region of the globe, nor are the northern parts of our own island untenanted by animals of this description.

Among the family of *amphibia*, or amphibious animals, are the various species of seals, (figs. 40, 41, 42, 43), and the walrus (fig. 44). These animals chiefly inhabit the cold regions of the globe, and the Greenland seals appear to extend their range along the whole of the Arctic coasts, both of the Old and New World. Some species, however, are met with in more southern latitudes, two or three species being found on the shores of Scotland and Ireland; and seals descend to a more southern parallel of latitude on the eastern coast of America, than in western Europe. The walrus is found in all the Arctic seas, and descends on the coast of North America to the 47th parallel of latitude. The Southern Ocean has also its peculiar species, among which are the ursine seal, the fur seal, and the elephant seal.

The order *Rodentia* includes the beaver (fig. 49), hare, squirrel (fig. 52), mouse, rat, porcupine (fig. 59), &c. The rodent animals are mostly timid creatures, and, except in extreme necessity, subsist by gnawing vegetable substances. North America exceeds the other division of the globe in the number of different species of animals belonging to this order;

* This erroneous designation is said to have originated in a mistake of Buffon, who calls this animal a panther; but it appears that he described it from an ocelot, of which he considered it a larger species.

but with the exception of the spotted cavy, scarcely an instance occurs of one species being common to North and South America. The rodent animals of the Old World generally differ from those of the New, but the common mouse appears to be spread all over Europe and North America; and rats have been found in almost every land, whether continent or island, that has been explored; though probably, in many instances, these animals may have been undesignedly spread by the agency of man, and conveyed to such parts in ships or canoes, a circumstance which is considered evidently to have led to their introduction into America. The beaver, though now extinct in Britain, is met with on the banks of the Rhone, the Rhine, and other European rivers, and extends northwards into Scandinavia. In America its range reaches from the most northern woods to the 48th parallel of latitude. On the western side of that continent it descends to the 38th parallel. Hares of various species are very widely diffused both in the Old and New World. The principal abode of the common porcupine appears to be in the warm regions of Asia; North America, however, possesses a species which has a much more northern range. The South American species (fig. 55*) differs totally in appearance from the well-known species, the quills being very little raised, and the animal furnished with a prehensile tail. This is not the only instance of an American rodent animal possessing a prehensile tail; the capromys, a native of the island of Cuba, having a similar appendage.

The order *Edentata* includes the sloth (fig. 58), ant-eater (fig. 69), armadillo (fig. 59), chlamyphorus (fig. 60), manis (fig. 62), and orycteropus (fig. 63). A large proportion of the animals composing this order are natives of South America. The manis, or pangolin (fig. 62), however, inhabits India, and the orycteropus, or Cape ant-eater (fig. 63), is a native of Africa.

The order *Marsupiiata* includes the kangaroos (fig. 45), opossums (figs. 47, 48), and that singular animal the platypus or ornithorynchus (fig. 64), as well as the echidna (fig. 65). By far the greater number of animals belonging to this order are inhabitants of Australia; although one species, the pha-

larger, is found in the Moluccas, and America possesses two species of opossum, called the didelphys, distinguished from the Australian opossums in being provided with a prehensile tail; a peculiarity, it will be observed, common to several American species of various orders. The opossums are carnivorous animals, but the kangaroos live exclusively on vegetable food; and in Australia, the presence of the latter animals is usually indicative of the vicinity of water and good pasture land.

The order *Pachydermata* is remarkable for the magnitude of some of the animals it includes; and also for the small number of species met with in the New World.* Animals of the order pachydermata are for the most part inhabitants of the warm or temperate regions of the globe. Among their number we find the elephant (figs. 66, 67), rhinoceros (figs. 69, 70), hippopotamus (fig. 68), hog (fig. 74), horse (fig. 77), zebra (fig. 79), &c. All these are confined to the Old World, though the Indian and African elephants are distinct species; and not only do the rhinoceroses of Asia and Africa differ, but even the species of Northern and Southern Africa are distinct, the one-horned being found in the Northern parts, and the two-horned and the white rhinoceros being met with in Southern Africa. The hippopotamus appears to be peculiar to the rivers of Africa. The two genera of the order pachydermata which are indigenous to America, are the tapir (fig. 71), and the peccari (fig. 73). The former, differing however in species, occurs in Sumatra (fig. 72). The wild boar, similar in species to that anciently an inhabitant of Great Britain, appears to occur in Africa, and to extend its range across the whole of the Old Continent; though in China it has probably long been extirpated, and given place to the domestic variety, for which that country is celebrated. The waart-hog, or engallo (fig. 75), is a distinct species, peculiar to Africa. The peccari is peculiar to the New World, where the hog was unknown, until introduced by the Spaniards towards the end of the fifteenth century; but these animals

* The vast proportion of animals belonging to this order, found among the extinct genera and species of the Tertiary Period, will be remembered by those who have accompanied us in our *Recreations in Geology*.

have run wild, and formed large herds, both in North and South America.

The numerous troops of horses which now inhabit the New World are also considered to be of European origin. This

. Noblest of the train
That wait on man, the flight-performing horse,

appears, in the earliest historic periods, to have been very generally diffused over the Old World. We learn, from the Book of Genesis, that horses were employed in chariots, and also for equestrian purposes, by the Egyptians in the time of the patriarch Joseph; and we also find, at a later period, that King Solomon obtained horses from Egypt, which has been called "the central and original riding school of the whole world." Horses evidently existed in a wild state at a very early period in the land of Edom; and in the time of the prophetess Deborah, they formed part of the host of Jabin, king of Canaan. "Herodotus," says Cuvier, "informs us, that horses existed in a wild state on the banks of the Hypanis (now the Dniester). Strabo says, that wild horses were found in India, on the Alps, in Iberia, among the Celts, and finally, on Caucasus." And, according to more modern accounts, it appears that wild horses are still to be met with in Western Tartary, and in the Russian steppes. This valuable and beautiful animal seems to arrive at its full perfection in the warm and temperate regions of the earth, and to degenerate in cold climates. The dziggtai, or wild horse of Mongolia, is a totally distinct species.

The ass (fig. 78) appears also to be a native of the warm and temperate regions of the Old World, and the Syrian varieties greatly surpass in size and beauty those with which we are familiar.*

The order *Ruminantia* includes all animals which chew the cud, such as the cow, sheep, deer, &c. Two species of ruminant animals are common to the New and Old World; and in this instance, as well as in others which have fallen

* The ass appears to be unknown in Russia. Captain (now Sir James) Alexander, when on the frontiers of Russia, was called out by some Russian officers to see what they termed a most strange animal; he went out expecting something very marvellous, when, to his great surprise, he beheld an ass tied to a tree.

under our notice, these are the two species which have the most northerly range—the elk and the rein-deer. The mountain sheep of North America is also supposed to be identical with the argali of Siberia. Animals of the cow kind are very generally diffused over the globe, with the exception, however, of South America and Australia,* neither of which possess any native species. The progress of cultivation has caused a total change, both in Europe and other parts, in the distribution of animals belonging to this genus, though it appears that, within the historical period, the vast swampy forests of Middle Europe and Asia abounded with the zubr, or urus (fig. 95); but this animal is now almost exterminated, though still met with in Lithuania, and perhaps in some parts of Asia. The arnee, or humped buffalo, inhabits the woods and swamps of India, the zebu, or common buffalo (fig. 96*), being of the same species; to which, indeed, our domestic races are considered to belong. The yak, or grunting ox (fig. 99), inhabits the high lands of Central Asia. The Cape buffalo (fig. 96), remarkable for its spreading horns, is a native of Southern Africa; and the bison (fig. 97), and musk ox (fig. 98), are inhabitants of North America.

The elevated parts of Central Asia appear to have been the original habitation of some of the finest fleece-bearing animals; and at the present day, the Tibet sheep and goats are surpassed by none in the value of their fleeces. Asia possesses a variety of sheep remarkable for its broad tail; and the same species also occurs in Africa; in the latter division of the globe, we meet with many other varieties, among which one of the most remarkable is the Angola sheep. Europe contains numerous races; but the most remarkable is, perhaps, the Wallachian sheep (fig. 102). This species is considered identical with one still met with in a wild state, in Candia, or Crete. In the same island, as well as in Sardinia, another species, called the musmon, also occurs in a wild state. In North America, we meet with a species which inhabits the

* The circumstance of Dr. Leichardt's having met with the buffalo in his recent travels in the northern parts of Australia, might seem to lead to a different conclusion with regard to that region. He supposes, however, that they may have been introduced at some remote period, and run wild in the woods.

Rocky Mountains, hence called the Rocky Mountain sheep (fig. 103). The goat family occurs in all the three divisions of the Old World, and one species is known in North America. Among the animals of this family, the most remarkable are the ibex (fig. 100), and the Tibet goat (fig. 101). The giraffe (fig. 83) is peculiar to Africa; and the llama family (fig. 82) is confined to South America. Nearly seventy species of antelopes have been described, and of these fifty are peculiar to Africa, besides two or three additional species which are common to Africa and Asia; twelve are considered peculiar to Asia; two species, including the chamois (fig. 88), and sasin, or common antelope (fig. 89), inhabit Europe, and only one species has been observed in America.

The order *Cetacea* includes the whale, dolphin, dugong, porpoise, &c. As these animals traverse the ocean in pursuit of their prey, the limits of their geographical distribution will differ in some degree from that of terrestrial animals, and be determined rather by the seas they inhabit, than by the shores they occasionally frequent. Animals of this order are, however, imperfectly known, though it appears that ten species of true cetacea have been observed on the eastern shores of America, all of which probably extend their range to the shores of Europe. Among these are the Greenland whale, dolphin, grampus, narwhal, &c. These inhabitants of the northern ocean occasionally descend to lower latitudes, and our own shores are not unfrequently visited by various species; whilst the porpoise extends its range all round our coasts. The tropical regions of the Atlantic afford us a species of cetacea in the lamantin, or manati, which inhabits the shores both of Africa and America, and is a herbivorous animal. The Northern Pacific presents us with its peculiar species, among which is the rytina (fig. 104), a herbivorous species, which frequents the shores of Kamchatka and of North Western America; while the dugong (fig. 105) is found in the warmer regions of the same ocean. The Southern Ocean again has its appropriate species, some of which extend their range to the shores of Tierra del Fuego, or to those of Australia.

It may appear that, in our consideration of the geographi-

cal distribution of terrestrial mammalia, comparatively little mention has been made of islands; but it will be found that islands situated at a distance from any continent are mostly destitute of land mammalia, with the exception of such as have been conveyed thither by the instrumentality of man; and islands which are contiguous to a continent usually contain animals similar to the mainland, and may be considered as included in its general description.

It would be highly interesting, as well as illustrative of the wisdom and goodness of the Creator, to enter at large into some consideration of the remarkable adaptation of each species to its natural condition. This, however, we cannot at present attempt; and must content ourselves with the general remark, that the more the subject is investigated, the more convincing proofs do we obtain, that all God's creatures are designedly and remarkably fitted for the stations in which they are placed. "Animals the most uncouth are in every respect adapted to their condition," says Sir Charles Bell; and it is a "mistaken compassion which is felt for creatures of a peculiar form." Some acquaintance with the habits, as well as the anatomical structure of animals is, however, requisite to render this apparent; and it is solely by such means that the beauty and excellence of the whole system can be unfolded to our view. To mention only one or two examples:—deer, hares, and other animals, designed to seek safety in flight, have limbs formed expressly for speed; whilst those of the elephant are formed for strength, and adapted to support the enormous weight of his body. The chamois and ibex, which dwell among mountains, as well as others of the same tribes, which are rapid in their motions, possess the power of discerning objects at a great distance; whilst heavy and slow animals, such as the rhinoceros and hog, whose natural habitation is in valleys, are near-sighted. Animals of the torrid zone, such as the Barbary dog, and the apes, are supplied with a very slight coat of hair; but the animals of the Arctic regions, such as the sable, ermine, bear, &c., are provided with the thickest furs.

If by accident, or by the agency of man, an animal be removed to a station for which in its natural condition it is

unfitted, the creature will either perish absolutely, or its original constitution will be modified to suit its new habitation. Thus the different kinds of dogs, of horses, of sheep, are all varieties of the same species, produced by merely accidental causes, such as domestication, climate, &c. As an instance, we may mention that the fleece of the sheep is liable to variations according to the temperature of the region in which it is placed; and in warmer regions the wool is usually replaced by hair. The sheep originally transported into the New World, was a variety with coarse rough wool. A remarkable change is observable in the fleece of the race (descended from these sheep) which now inhabits some of the warm valleys of South America. The lambs possess this woolly fleece, but if left unshorn, this coarse wool falls off, and leaves a short glossy, and compact hair. In some parts of the same region, the cows, also, instead of having rough hair, similar to that of the horned cattle of temperate zones, have their skins as bare as that of a Barbary dog.

It will be evident that the radiata division of animals rank the lowest, and the vertebrata, but more especially the mammalia, rank the highest in the scale of animated beings. At the head of the latter, and, indeed, of the vast system of organized creation, stands the order *Bimana*, containing, however, only one genus, one species—*MAN*: forming a remarkable link in—

The mighty chain of beings, lessening down
From Infinite Perfection to the brink
Of dreary nothing.

The extent of this vast system has been greatly displayed by the study of fossil organic remains; extinct species having, in many instances, supplied links apparently wanting in the chain before these discoveries were made. As an illustration of this "lessening down," we may mention, that throughout the entire orders of mammalia, a gradual departure from the form of man is observable. Thus, the hand of man may be recognised in the ape; whilst, in some of the American monkeys, the thumb is almost wanting. In the macaucos, the hand begins to appear deformed, and continues to deteriorate through the hedgehogs, the moles, and the bears. It

becomes a paw when we arrive at the dog. Afterwards, in the sloth, the nails exhibit the transition to the solid hoofs of the sheep, stag, and ox, and terminate in the uniform hoof of the horse. Finally, we find in the whales and dolphins no other vestige of a hand or arm than a stump, rudely fashioned as an oar. Yet, on investigation, the principal bones of the hand and arm are found, though in a rudimentary form, strongly marking the wideness of their separation from the perfectly developed hand of man.

CHAPTER IX.

GEOGRAPHICAL DISTRIBUTION OF MAN.

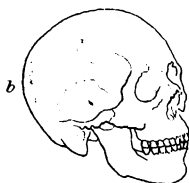
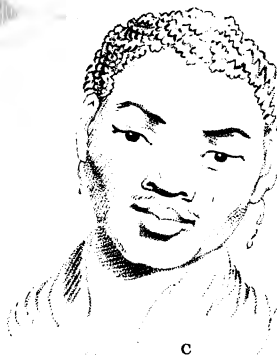
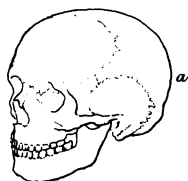
Our two first parents, then the only two
 Of all mankind. *Paradise Lost.*
 The world was all before them, where to choose
 Their place of rest, and Providence their guide.—*Ibid.*

THE geographical distribution of man over the surface of the globe claims our next consideration. This, however, totally differs in character from any that has hitherto arrested our attention. Man, as we have seen, is a single species; and though there are *varieties* of the human race, the researches of the physiologist and comparative anatomist confirm the account given to us in the Sacred Scriptures, that the various tribes of men are of one common origin.

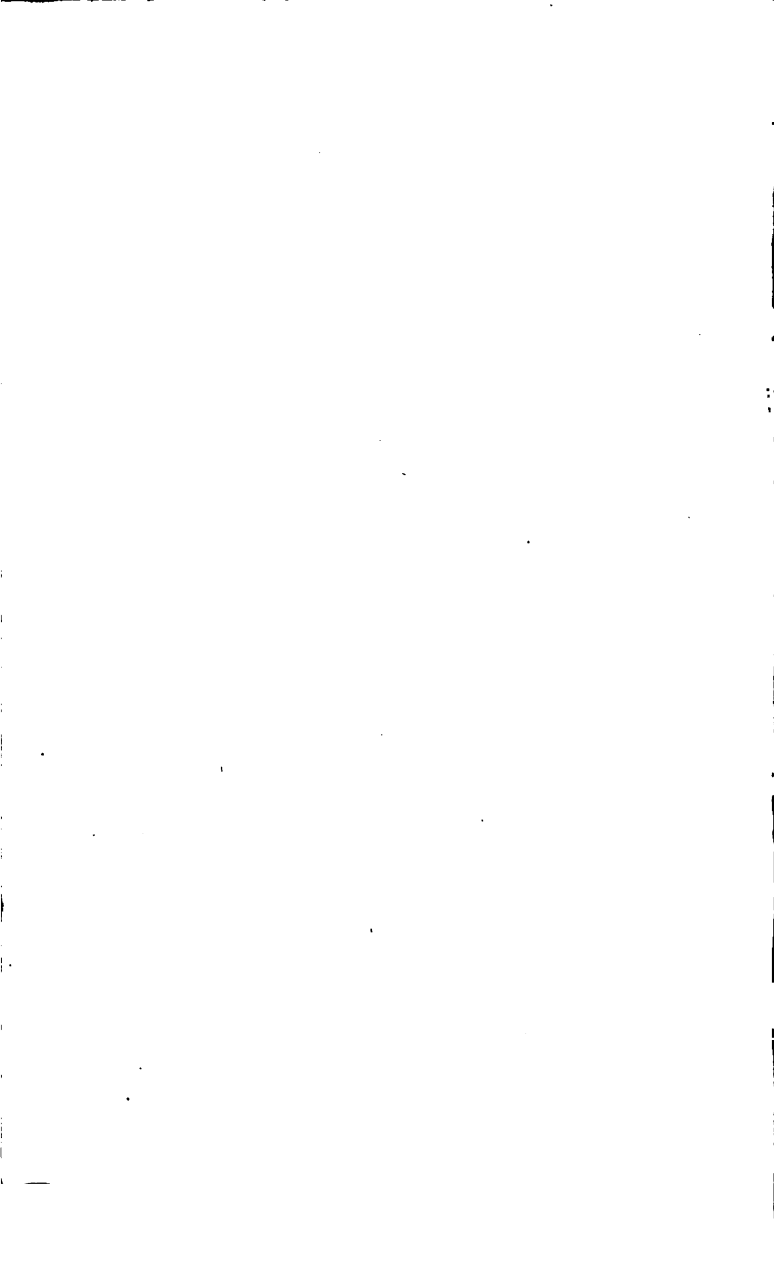
Many naturalists have attempted to classify the human species into several *races*, distinguished from each other by peculiarities in the form, colour, and structure of their bodies. The most generally received system is that which has been adopted by Cuvier in his *Règne Animal*, which is regulated by the form of the cranium, and which fixes the number of races at three, viz., the Caucasian, or white; the Mongolian, or yellow; and the Ethiopian, or black.

The assigned characteristics of the *Caucasian* race (Plate VI. figs. A a) are a fair skin, with colour in the cheeks;*

* The Indian branch, it will be observed, forms an exception to this characteristic.



A. a. *Caucasian*
 B. b. *Mongolian*
 C. c. *Negro*



an oval head and expanded forehead: soft hair, varying in colour from black to light brown and flaxen, and waving, or slightly curled; eyes varying from blue to dark brown; nose thin and rather aquiline, or straight; small mouth, and a full and rounded chin. This race is considered to include the Jews, the ancient Assyrians and Babylonians, the Arabs, Phœnicians, and Abyssinians, as well as the Medes, Persians, Affghans, and the higher castes of India; the Greeks, also, and all the civilized European nations. The human intellect is considered to have been most highly developed in the Caucasian race.

The *Mongolian* race (figs. B b) is characterised by a yellow or olive skin; square broad-faced skull, with a low and narrow forehead; black eyes, black hair, coarse, lank, and thin; a broad and flattened face; a wide mouth and thick lips. The Mongolian race is represented in the present day by the nomadic Mongolians and Kalmucks, and by the lower castes of India, as well as by a considerable portion of the inhabitants of the northern regions of Europe and Asia; the Laps, or Laplanders, the Samoieds, Kamtchatdales, &c.

The *Ethiopian*, or *negro* race (figs. C c) is characterised by a black or very dark skin; a narrow and compressed skull; a low and narrow forehead; woolly, crisp, coarse hair, collected into little knots; black eyes; a flat and broad nose, thick lips, (especially the upper lip,) and a small chin. This race is considered to occupy the whole of Africa to the south of the Great Desert.

Those who adopt this classification find, however, certain races which, from the form of their cranium, cannot be included under the head of either of these races. "Neither the *Malays*, nor the *Americans*," says M. Cuvier, "can be clearly referred to one or other of these three races." And, accordingly, those who follow that distinguished naturalist have recourse to the introduction of *anomalous races*, amongst which the Malays and Americans are included.

Other authors, again, augment the number of varieties of the human species to five, seven, or even ten. Thus, Blumenbach (who preceded Cuvier) fixed the number at five; adding to the preceding divisions the Malay and the American.

And, more recently, Dr. Prichard has extended the number to seven; namely, the Caucasians, Mongolians, Negroes, Americans, Hottentots, (with which are classed the Bochimans,) Papuans, (or the black and woolly-haired inhabitants of New Guinea, and some neighbouring islands,) and the Alfourous, (or the tawney and straight-haired inhabitants of the same region, with whom are classed the Australians.) And yet more recently, M. Flourens, also adhering to the form of the skull, appears to have established ten distinct forms, or types of human heads; adding to those of Dr. Prichard, the Malay and the New Zealandic, and separating the Bochimans from the Hottentot.

The colour of the skin in the human species, which, as we have already seen, differs in the Caucasian, Mongolian, and Ethiopian races, might be also considered to constitute a distinguishing mark of its varieties; and from the recent researches of M. Flourens, there appears reason to expect that future investigations may lead to some such result. That naturalist has discovered that, in the skin of the Ethiopian, or black race, a particular apparatus occurs, under the second epiderm, consisting of a *lamina*, or layer of complicated structure, and which is the seat of the *pigmentum*, or colouring matter of the negro.* M. Flourens has also discovered, that a similar pigmental apparatus, of a red hue, occurs in the Red or American race, imparting to the skin the red or copper-coloured tint, by which that race is distinguished.

That further investigations may lead to the discovery of a similar apparatus, though of different hue, in the other coloured races of the globe, appears highly probable; and also that, in this number, some portion of the Caucasian race will be included, but more particularly the Indian branch. This classification, according to the colour of the skin, may therefore lead to a different arrangement of the varieties of the human species, or at least to subdivisions, which may tend to prove, that remarkable as is this pigmental structure, it can only be considered as an accidental variety.

* This is stated to form a distinct and continuous lamina, altogether wanting in the white or Caucasian race; and not to be, as supposed by former anatomists, arranged as a network, occurring in all, though coloured only in the black race.

Another mode of classifying the varieties or races of mankind is by the affinity of languages. This, perhaps, is both the most interesting, and also likely to lead to the most satisfactory results. It appears that the number of human idioms, widely differing from each other, is very great; and according to Dr. Prichard, the probable number of languages spoken over the whole globe cannot be much under 2000.

A comparison of various languages, however, shows that many have a family resemblance, or relationship, subsisting between them, which is exhibited in the circumstance of a large proportion of their elements, or roots, being common to the whole group, united with a general resemblance in their grammatical structure. Nations, whose idioms have this affinity, are considered to be allied in origin. Groups of idioms thus related are termed *families of languages*.

One strongly marked family of languages consists of the dialects collectively termed the Semitic: (so named from the supposed descent of the nations who speak them, from Shem, the son of Noah.) To this family belong the Hebrew, the Aramean, (which includes the Babylonian and the Syriac,) and the Arabic, to which the Ethiopic is very closely allied.

Another family of languages is the Indo-European, which includes various idioms of Europe and Asia. This is a most extensive group, and contains six branches, two of which belong to Asia, and four to Europe. 1. The Sanscrit, and all its dialects in India. 2. The ancient Zend, or Medo-Persic language, as well as the ancient Pehlvi and Devî, and all the idioms now spoken in Persia and Armenia. 3. The Greek and Latin languages, and all the dialects sprung from them. 4. The Sclavonic, the origin of the Russian, Polish, and Bohemian languages. 5. The Teutonic, with the Gothic at its head, and comprising the different German dialects, the Anglo-Saxon, Danish, Swedish, &c. 6. The Celtic, comprising the Welsh, Cornish, Gaelic, Erse, &c. It will be evident, that these two groups, the Semitic and Indo-European, extend over the whole portion of the globe inhabited by the Caucasian variety; and, through European colonists, the European branches have extended to America and other parts of the world.

Another accordance existing between languages is that of *analogy*. Many idioms which are entirely distinct from each other, and have few, or perhaps no words in common, are yet found to bear a striking resemblance in their grammatical structure. Languages bearing this resemblance are not considered as belonging to the same family, but to the same *school* or *class* of languages. Thus, a strongly marked class, are those termed *monosyllabic*; the words belonging to such, consisting of monosyllables. Idioms of this description are spoken by the Chinese, Tibetians, Siamese, and nearly all the Indo-Chinese nations. But the languages of these nations, though possessing this agreement of structure, are totally distinct from each other.

Another class of languages are those termed *polysynthetic*; these consist of long polysyllables, refined and elaborate in their construction, and admitting of almost endless changes of termination. To this very remarkable class of languages belong all the idioms of America, from that of the Esquimaux at Behring's Straits, to the dialects of Patagonia and of Tierra del Fuego. And yet, fifteen hundred different dialects are said to be spoken in different parts of that continent, though these are referred by Dr. Prichard to a few great divisions.

"The diversities of language," says Dr. Prichard, "carry us very far back towards the infancy of our race, and are, perhaps, much more ancient than the varieties of form and colour." The question has been asked, Whence has this diversity of language arisen? We naturally turn to the dispersion incident on the confusion of tongues, as the era from which this diversity is to be dated; for we are expressly told, that before this "the earth was of one language and of one speech;" but that "the Lord did there confound the language of all the earth."*

It, however, appears, that whatever view physiologists take of the varieties of the human species, whether as distinguished

* To this commonly received opinion, an objection has been raised, that the dispersion of Noah's family had taken place previous to this period. This objection appears, however, wholly without foundation: for a careful examination of the 10th and 11th chapters of Genesis will show, that the 10th does not record events *antecedent* to those mentioned in the 11th chapter, but that it almost wholly consists of a genealogical register.

by form, by colour, or by affinity or analogy of languages, all arrive at the same conclusion, which we cannot express better than in the words of M. Flourens: "*Unity*," he observes, "*absolute unity* of the human species, and *variety* of its races, as a final result, is the general and certain conclusion of all the facts acquired concerning the natural history of man."

It has been said, that "man appears to possess a remarkable pliancy of constitution, and to be the only animal fitted by nature to inhabit every possible variety of climate. His animal existence is not less secured in the frozen regions of the Arctic circle, or under the burning climate of the equator, than in the intermediate countries; and he may be said to be the only true denizen of the whole world." There can be no doubt, that this power in the human frame to accommodate itself to different climates is, in some measure, attributable to the natural constitution of man, and to the peculiar conformation of his digestive organs, which are adapted to every variety of food; but this universality of the human race may, perhaps, be more correctly assigned to a far higher cause—his intellectual powers.

Where, may we not inquire, is the man, who, without artificial protection, could withstand the rigour of an Arctic winter? When God "casteth forth his ice as morsels, who is able to stand before his cold?" Inferior animals may, and various species do, by wonderful instinct, collect stores of provisions against the winter; but man alone learns to guard his own body from the intense cold; man alone learns to kindle a fire; and it is by his own ingenuity, by the prudent choice of means, and by profiting from the experience of those who have preceded him, that man is enabled to become a cosmopolite. Inferior animals, on the other hand, have particular appointed stations, suited to their nature, and to the instincts with which they are endowed. They are incapable of profiting by the experience of their predecessors, nor is it needful that they should; for although we find

Reason progressive:—instinct is complete;

they, "without instruction, are equal to the task assigned to them. In their performances, we often admire the ingenuity

of the contrivance, and the complexity of the work ; but it is the ingenuity of the species, not of the individual ; or rather, it is the wisdom of God, not the deliberate effect of invention or choice. The animal's task is prescribed, and his manner of performing it secured."

✠ The capability of indefinite improvement is one of the distinguishing characteristics of MAN : he is endued with powers of judgment, of generalization, of imagination, with a guiding conscience. And fallen as he is, from the state in which he came out of the hand of his Creator, man is yet immeasurably raised above the brute creation : he belongs to a more exalted order of beings : he possesses a spirit capable of restoration to the Divine image.

Say, why was man so eminently raised
Amid the vast creation ? why empowered
Through life and death, to cast his watchful eye
With thought beyond the limit of his frame,
But that the Omnipotent might send him forth,
In sight of angels and immortal minds :

* * * *

Might send him forth, the sovereign good to learn,
To chase each meaner purpose from his breast ;
And through the storms of passion and of sense,
To hold straight on, with constant heart and eye
Still fixed upon his everlasting palm,
The approving smile of Heaven ?

CHAPTER X.

GENERAL FEATURES OF THE EARTH—THE BRITISH ISLES.

Through wide Nature's bounds
Expatiate with glad step, and chose at will
Whate'er bright spoils the florid earth contains,
Whate'er the water, or the liquid air.

AKENSIDE.

WE have now taken a brief survey of the leading principles of Physical Geography, including the general structure of the earth, the phenomena of earthquakes and volcanos, the arrangement of land and water, the causes of atmospheric changes, and of diversities of climate, and, lastly, the geogra-

phical distribution of the animal and vegetable creation, concluding with that of the human species. We have seen that certain laws prevail over the whole earth; we further propose, by way of recreative illustration, rapidly to conduct our readers over the several regions of the globe, and thus to enable them, whilst they "sit at home at ease," without encountering either the risk or the fatigue of extensive travelling, to observe for themselves, to see these laws carried into practice, to trace them in their application to the natural world. And although we may not equal the celerity of Puck, and

. Put a girdle round about the earth
In forty minutes;

our travels will be conducted with considerable rapidity.

. As the bee
From flower to flower, so we from land to land:

and we trust that, like that honey-gathering insect, we also, in our progress, may collect some useful stores. For though we do not suspect our readers of supposing, with certain Hungarians, that Mexico is an English island, or that sugar and coffee grow in Britain, we think it not impossible that we may, whilst more especially directing their attention to the natural distribution of organized beings, and the influence climate and the variation of the earth's surface exercise on their distribution, at the same time have an opportunity of introducing to their notice some productions of the earth with which they are not familiar,—some fresh instances in which they may trace the providential hand of the Giver of all good.

. The venerable name
Of our adored country, O thou queen,
Thou delegated deity of earth,
O dear, dear England!

COLERIDGE.

The British Isles form a very minute and apparently insignificant portion of the whole globe; but as to us, who are inhabitants of the soil, they possess a supreme interest, we shall be excused if we pause to take a rather more enlarged survey of our native land, ere we commence our travels across the wide regions of the earth.

If we look at a map of the British Isles, we shall perceive that they extend from the fiftieth to the sixty-first degree of north latitude, and that the extreme breadth comprehends about the same number of degrees of longitude. It cannot, however, fail to strike us, that the length is considerably greater than the breadth, an observation which will be confirmed by actual measurement, for the length from Hermaness to Lizard Point is about 770 miles, whilst the greatest breadth, from Yarmouth to Dingle Bay, does not exceed 460 miles. We shall, however, readily account for this, when we call to mind that a degree of latitude, which, at a rough estimate, contains seventy miles, is the same, or nearly the same,* in all parts of the earth; but that the degrees of longitude decrease in a regular proportion from the equator to the poles, and that at the parallel of Yarmouth each degree contains only forty-two miles. The following table exhibits the different ratios of the degrees of longitude in various parallels of latitude:—

Latitude.	Miles.
0°	68 $\frac{3}{4}$
10°	67 $\frac{1}{2}$
20°	64 $\frac{1}{2}$
30°	59 $\frac{1}{2}$
40°	52 $\frac{1}{2}$
50°	44
60°	34 $\frac{1}{2}$
70°	23 $\frac{1}{2}$
80°	12
90°	0

Although the surface of England is of a diversified character, it does not contain any elevated mountain ranges. Westmoreland, indeed, and part of Northumberland, Cumberland, Lancashire, and Yorkshire, are mountainous; but most of the other counties of England present rather a series of picturesque eminences, than of elevated ridges or peaks; and some of the eastern counties are remarkable for their level

* The slight increase in the degrees of latitude, as we approach the poles, occasioned by the oblate, or flattened form of that part of the globe, is not of sufficient amount to be here taken into consideration.

surface. This absence of high land, added to its insular situation, renders the climate of the southern part of the island particularly mild. The highest summits in England scarcely exceed 3000 feet above the sea. The most elevated, being—

. . . . The dark brow of the mighty Helvelyn,
Lakes and mountains beneath gleaming misty and wide;
On the right, Striden-edge round the Red-tarn is bending,
And Catbedicam, its left verge is defending.

Wales is a mountainous country in all its parts, and contains some summits of greater elevation than any in England, though none approaching the limits of perpetual snow; Snowdon, which is the most lofty, not exceeding 3571 feet above the level of the sea.

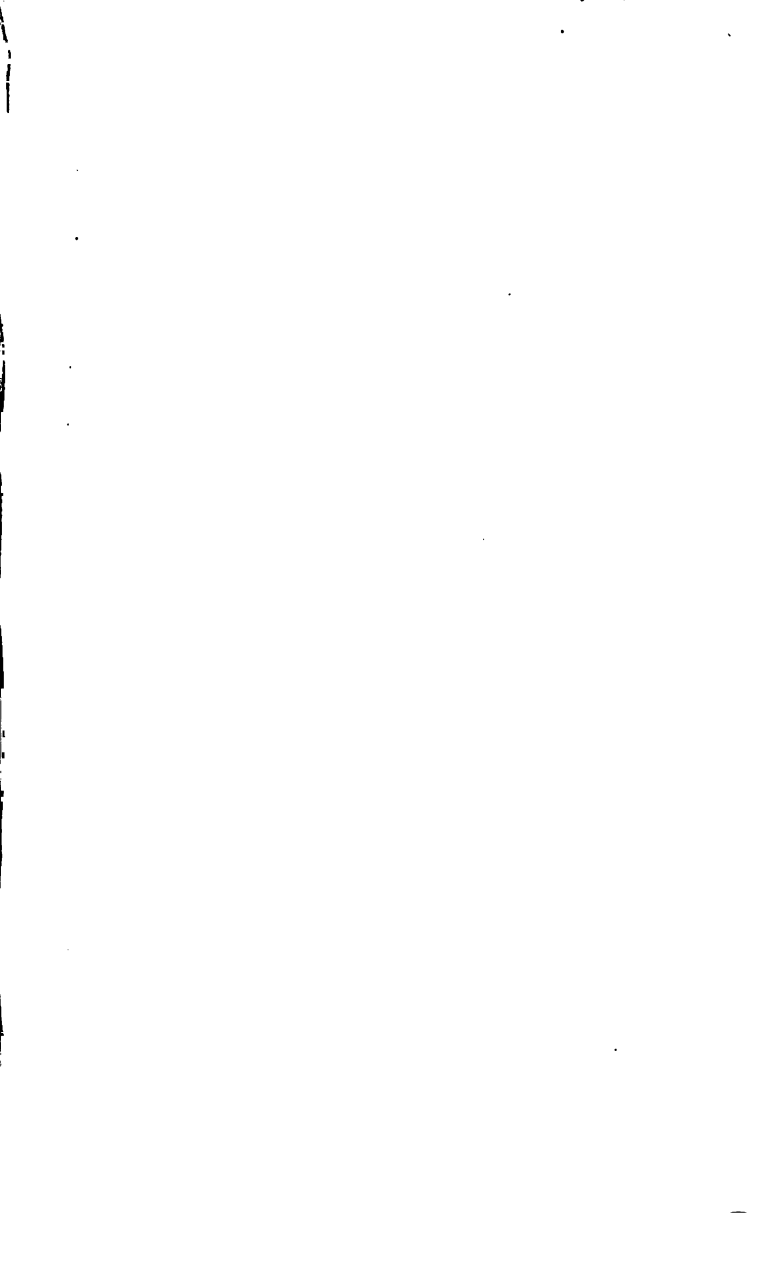
The mineral treasures of England and Wales are very great. "Coal, one of the most useful of all the productions of the earth which it has pleased the Almighty to provide for the use of man," is remarkably abundant in our own favoured isle, especially in the western and northern districts, to which, indeed, the *true* coal formation is nearly confined.

Iron, the mineral of greatest importance next to coal, abounds in Staffordshire, Derbyshire, and Wales; it also occurs, in conjunction with coal, in the Forest of Dean, where it is worked to a considerable amount; we likewise meet with this valuable mineral in Surrey and Sussex; and, though in smaller quantities, in various other localities. Tin is found in Cornwall and part of Devonshire. These counties have for ages been celebrated for their supply of this rare and peculiar metal, with which it is even supposed that they furnished ancient Tyre. Copper is found in Cornwall, Devonshire, Staffordshire, and Westmoreland, and also in Anglesea, and other parts of Wales. Lead occurs in Northumberland, Cumberland, Durham, Derbyshire, Shropshire, and Devonshire. Silver occurs in the north of England, and also in some of the south-western counties. In Devonshire it is met with both native (that is, pure), and in combination with galena, or sulphuret of lead, the latter yielding thirty-five ounces in the ton; and native silver is also met with in Anglesea. Native gold is found in the refuse of a mine in North Molton, in Devonshire; and the yellow copper of Gold

Scoop mine, near Keswick, is said to contain much gold. Garnets occur near the latter locality; and also, as well as tourmaline, in Devonshire. The most esteemed graphite or plumbago, in Europe, is obtained from a mine near Seathwaite, in Borrowdale. Petroleum, asphaltum, and elastic mineral pitch, occur in Shropshire and Derbyshire. The former rises to the surface in a bitumen-spring at Coalport; and the latter, called also mineral caoutchouc, from the property it possesses of effacing lead-pencil, is found in the lead mine at Odin in Mamtor. The finest alabaster in the kingdom occurs on the shores of the British Channel, where, between Watchet and Minehead, vast rocks of this elegant substance have been met with. These beautiful cliffs were, however, almost demolished by the severe storms of 1836. Salt, that almost indispensable necessary of life, is found in great abundance in this island. The extensive deposit at Northwich, in Cheshire, occurs in beds sixty feet in thickness; and is supposed to be two miles in length, and about three-quarters of a mile in breadth. The annual produce of the Cheshire salt mines is estimated at fifteen millions of bushels.

Scotland, in its general outline, consists of two perfectly distinct parts, the Highlands and the Lowlands. The Lowlands comprehend the whole country south of the Friths of Forth and Clyde, likewise extending to the north of the Forth on the eastern coast, through the counties of Fife, Forfar, Kincardine, and Aberdeen, to the borders of the Moray Frith, which latter, though situated in a higher latitude, yet, owing to its sheltered position, enjoys as mild a climate as any part of Scotland. A considerable portion of the Lowlands is very hilly, but none of the summits exceed the height of 3000 feet above the sea. The most remarkable are the "Cheviots grey," celebrated in the annals of border warfare.

Immediately north of the Clyde, the Highland ranges begin to rise. This region "stern and wild," consists wholly of continuous ranges of lofty mountains, which, on their southern borders, leave between them some of the fine broad valleys called *straths*; but in the interior, they are only intersected





The Vale of Glen Cce

by the rocky intervals called *glens*. One of the most remarkable of these is Glencoe, which, in terrific grandeur, perhaps surpasses every other spot in Great Britain. The bold and broken forms of the surrounding mountains, the abrupt and pointed rocks, and black precipices, all conspire to give it a gloomy but picturesque character, whilst at the bottom of the glen flows the little river Coe, the Conan of Ossian.

The mountains of Scotland, especially the great Grampian barrier, which extends across the counties of Perth and Argyle, are so continuous, that they can only be entered by formidable passes. Several of the summits approach the altitude of 4000 feet, and some exceed that elevation. The most lofty is Ben Macdui, which attains the height of 4418 feet above the sea level. Ben Nevis is about sixty feet lower. Other summits, of nearly equal elevation, also occur on the borders of Inverness and Ross-shire. These mountains usually dip almost perpendicularly into the lakes and seas on which they border; and even the valleys are on so high a level above the sea, that they admit only of the culture of the coarser species of grain, and that in scattered patches. Nor do the lowlands present any extensive plains, such as are met with in South Britain, for even the Lothians are hemmed in by low ridges of bleak table lands, covered, in a great measure, with heath and moss:

And rich the soil, had purple heath been grain.

The arable lands are almost solely comprised in the broad flat valleys called *straths*, or *carses*. It is in a valley of this description that Inverness is situated; and it is owing to this local circumstance that, as before mentioned, the culture of wheat extends to that limit.

The Isles of Scotland may be considered as forming a third division of that country. On the east, indeed, and even on great part of the south-western coast, only a few bold and naked rocks rise perpendicularly from the ocean. But the western highlands are bordered by the Clyde Islands and the Hebrides, some of which are separated from the main-land by such narrow channels, that they may almost be considered as

forming part of it. Bute, which contains no lofty summits, but which is beautifully varied with hill and dale, possesses the mildest climate of any part of Scotland. Arran is remarkable for its magnificent and imposing scenery, and for the interesting geological phenomena it exhibits. The Hebrides (with the exception of Isla, once the residence of the "Lords of the Isles," and which is in great part level and fertile) are chiefly characterized by rude rocks and mountains, deep valleys, and large expanses of peat-mosses. Staffa, which is scarcely more than a large rock, is celebrated for containing the splendid basaltic formation, called Fingal's Cave. Almost all the rocks of this islet are basaltic and columnar, some being bent and twisted in a remarkable and beautiful manner. Besides Fingal's Cave, two others, called the Cormorant's Cave, and the Boat's Cave, present similar scenes, but with interesting varieties. The climate of these islands is, generally speaking, unfavourable to the growth of trees; and it is almost proverbially said of Coll, "that there never was a plant more than three feet high in that island." It, however, yields a profusion of beautiful flowers.

The northern extremity of Scotland is prolonged by the two ranges of the Orkney and Zetland, or Shetland Islands, which, though some distance apart, are arranged in a linear direction. These islands are not mountainous, but are rocky and bare, and exposed to excessive moisture, and to the violent winds which sweep across the Atlantic Ocean. The "storm-swept Orcades," or Orkneys, are exceedingly irregular in their form; the deep sounds by which they are penetrated, and the narrow straits which separate them from each other, causing a complete intermixture of land and sea. These islands are generally bleak, boggy, and bare. The Zetland Isles, though not, as supposed by the ancients, the Ultima Thule, or remotest boundary of the habitable world, nevertheless form one of the boldest extremities of Europe. Surrounded, too, as they are by the sea, and unscreened from the Arctic and Atlantic Oceans, the climate of these islands is cold and bleak, and they are swept by furious winds, and deluged by torrents of rain. The extensive peat-mosses, and the trunks of trees found in the peat, prove that a con-

siderable portion of these islands was at one time covered with forests; but the latter have totally disappeared, and the violence of the winds and sea-spray having rendered every attempt to replace them unsuccessful, the aspect of the country is now completely bare, scarcely producing a shrub. We cannot, however, but suppose that some change must have occurred in the climate of these islands; and it is not improbable that they were, at no very remote period, of larger extent: for so great is the power of the mighty waves of the Atlantic, that all the islands have become completely intersected with long *lagoons*, or lake-like inlets, termed *voes*; and even in the largest islands there is now scarcely a spot which is two miles distant from the sea. On the western side of these islands, mere clusters of rocks remain in many parts, marking the site of some ancient island, and frequently assuming the most fantastic forms. These clusters are called *drongs*, and appear to be attributable to the different nature of the rocks of which the islands are composed, and to the more rapid disintegration of certain portions, whilst the more durable granite remains.

The mineral treasures of Scotland are not so great as those of England and Wales. It, however, contains some highly important coal fields, though these occupy a comparatively limited district. These coal fields are in some instances accompanied by a vast deposit of iron ore; and bog iron ore is met with in various parts of Scotland. Magnetic iron ore likewise occurs, particularly in the Zetland Isles; it being diffused through the mountain mass of Saxaford Hill, in Fetlar, in sufficient quantity to affect the compass in a remarkable degree. There is a large deposit of lead mixed with silver, in the high range between Lanark and Dumfries-shire. Native copper, and copper ores of various kinds, including malachite, occur; not, however, in sufficient quantities to yield much profit, but affording objects of great interest to the mineralogist, especially in the Orkney and Zetland Islands. Native silver is also met with; and some years since, a vein of silver was wrought with considerable advantage at Alva, in Stirlingshire. Silver likewise occurs in Argyleshire; and many of the female peasantry in Lorn fasten their cloaks with large silver brooches

of a circular form, said to be of ancient date, and made from the silver found in the hills, either native, or procured from the lead. Native gold is found at Glen-Turret in Perthshire, and also at Leadhills in Lanarkshire. The gold mines of Glengonar, in the latter locality, indeed, appear once to have been productive; for, in the reign of James the Fifth of Scotland, 300 men are said to have been employed in these mines. And when that monarch, in a hunting excursion, dined at Crawford Castle, he, at the termination of the repast, caused a few coins of gold to be placed before each of his retainers on wooden platters for dessert, as the native produce of the soil. These pieces were made from gold obtained in the mines of Glengonar, the rivulet on which Leadhills is now built. The produce at present is very small, but sufficient to form an object of interest to the miners of Leadhills, many of whom amuse themselves during their leisure hours in searching for gold; and on an average, 4*d.* worth of gold may be collected in six hours. Some pieces, however, have been found as large as a pea. Scotland also contains several other valuable minerals; and in some parts we meet with almadine, or precious garnet; ruby, hyacinth, amethyst, topaz, aqua marina, or beryl, cairn-gorm, agate or Scotch pebble, rose quartz, precious serpentine, &c.

Ireland is not, on the whole, a mountainous country, the central districts being occupied by one vast plain, crossing the whole island from east to west; its mountain ranges are nevertheless of greater extent than those of England, which they also exceed in elevation. They appear to be detached groups, unconnected with each other: the most elevated summits are in Kerry, which county presents a vast assemblage of wild and rocky mountains, among which Mac Gillicuddy's reeks, or peaks, situated near the beautiful Lake of Killarney, stand pre-eminent, reaching the height of 3410 feet above the level of the sea. Wicklow is also a very mountainous district; and the borders of Leinster are occupied by the long and lofty ranges of Slieve Boom, Knock-mele Down, and Galties; whilst the county of Antrim, at the northern extremity of Ireland, presents a barren range of rocky cliffs, less elevated, but of a bold and peculiar character, including

the remarkable and splendid basaltic formation, called the Giant's Causeway. The vast plain which occupies the interior, though it appears nearly level, abounds in hillocks and ridges of limestone, not unfrequently almost bearing the appearance of regular mounds, the work of art. In the hollows formed by these undulations, the vast peat-bogs, which occupy so large a portion of Ireland, are mostly situated.

Ireland contains many deposits of coal; some of which, though hitherto little explored, promise to be of great importance. In Connaught, iron occurs abundantly in conjunction with the coal deposits. Lead is met with in various parts of the island, whilst Ross Island, in the Lake of Killarney, contains a copper-mine; and a peat-bog, near Glandore Harbour, in the county of Cork, is quite impregnated with that metal. Native gold has been found in the Ballinvalley streams at Croghan Kushela, in the county of Wicklow. This deposit was accidentally discovered in the year 1796, and the secret having been divulged, nearly the whole population of the neighbourhood flocked to the spot in quest of the precious metal; and several hundreds of people might be seen daily assembled, digging and searching for gold in the banks and bed of the stream. The peasantry remained in undisturbed possession of it for nearly six weeks, during which time considerable quantities were collected. At that period Government took the matter in hand; regular steam works were established, and operations carried on with some success, until the period of the Rebellion in 1798, when the works were destroyed. The mining operations were resumed in 1801; but the return being inadequate to defray the expenses, the working was discontinued. The gold was found in alluvium, and occurred in grains and masses, varying in dimensions from the smallest dust to lumps of a considerable size. One piece weighed twenty, and another eighteen ounces. No estimate could be made of the quantity of gold gathered by the peasantry; the amount collected by Government did not exceed 950 ounces, valued at about 3675*l*.

Beautiful crystals are found in some parts of Ireland, especially in the granite of the Morne mountains, near Newry, where fine specimens of topaz and beryl occur.

In considering the diversities of climate on the surface of the globe, some allusion has been made to the difference of temperature on the eastern and western coasts of various regions, and to the effect produced by the westerly winds and currents of the ocean in moderating the cold of winter in Western Europe. We meet with a striking illustration of these remarks in the British Isles, recent investigations having disclosed the remarkable fact, that as far as regards *winter* temperature, the *isochimeneal lines*, or lines of equal temperature, instead of being dependent on the northerly or southerly situation of any district, appear to depend on its easterly or westerly position; so that, according to Mr. Petermann, if any one in the depth of winter were to travel from the Zetland Isles to the south coast of England, a distance of seven hundred miles from north to south, in the hope of enjoying a milder climate, he would probably be disappointed, for the *mean winter* temperature of Unst, one of the Zetland Isles, has been found to be precisely similar to that of the Isle of Wight—viz. 37° ; and it appears that the same remark is applicable to the whole of the south-eastern coast of England; in fact, to all parts not open to the influence of the westerly winds and oceanic currents. A very striking instance of this is afforded by the difference of the mean winter temperature of the western extremity of Cornwall and that of some parts of Devonshire; for while the mean winter temperature of Falmouth, Penzance, &c., is upwards of 42° , that of Sidmouth does not exceed 36° , and that of Exeter 34° . “And it appears beyond a doubt,” observes Mr. Petermann, “that the westerly winds, in travelling from the Cornish peninsula to Exeter, diminish as much as from 6° to 8° in their temperature by traversing the heights of Dartmoor.” Swansea, again, which, from its projecting situation, is exposed to the influence of the westerly winds and currents, has a winter temperature of $42\frac{1}{2}^{\circ}$. The mean winter temperature of the whole eastern coast of Great Britain appears not to exceed 35° , while that of the western coast of Ireland (as far as observations have extended) is not less than 45° . These remarks, it will be remembered, apply to winter temperature, for the isothermal lines, or lines of the hottest month, differ entirely—

extending from south-west to north-east; the highest *summer* temperature occurring in the central portion of the south coast of England, including the counties of Somerset, Dorset, and some parts of Devonshire, Wiltshire, and Hampshire; and the lowest, in the north-western parts of Scotland, whilst a marked difference prevails in the summer temperature of the eastern and western coasts of the latter region, a difference the very reverse of that observed in winter.

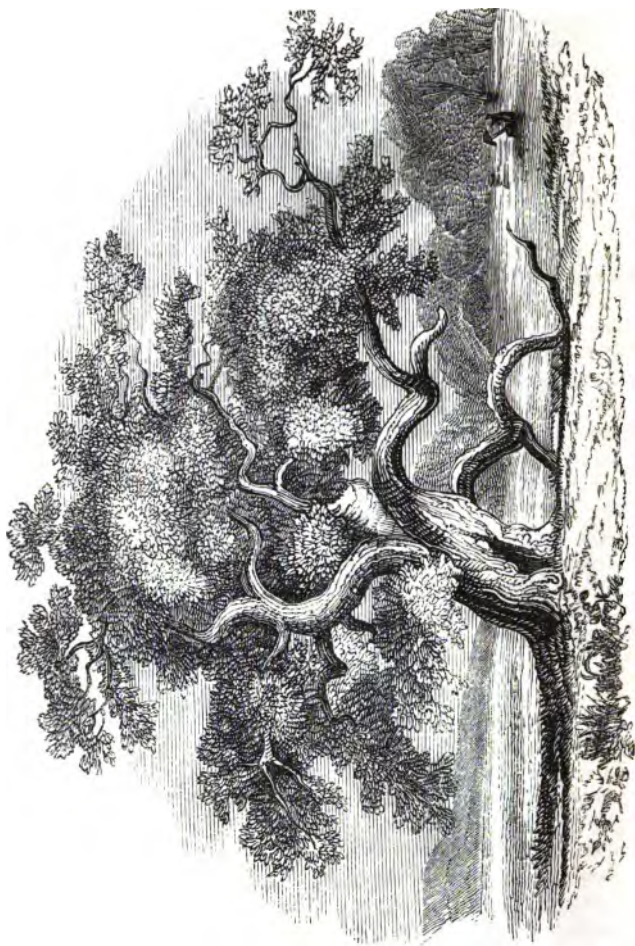
Flora of the British Isles.—It has already been remarked, that in temperate zones the distribution of plants depends in great measure on the average *summer* temperature, and also on the degree of cold any plant will sustain. The British Isles, surrounded on all sides by the sea, are subject to much rain, and exempt from intensity of heat and cold; and thus, whilst they escape the severe winters experienced in similar latitudes on the continent, they do not enjoy so much summer heat as continental countries. The consequence of this *insular* climate is, that some European plants, requiring a high summer temperature, fail of coming to perfection in these islands; whilst other plants, which will not stand the severe frosts of the continent, flourish with us. About three thousand three hundred species of plants are now known as natives of the British Isles; to which, however, only a very small number are exclusively confined. And though some of these plants are limited to small districts in these islands, it not unfrequently happens that they are met with in distant regions of the globe. Thus the jointed pipewort (*eriocaulon septangulare*,) is confined to a few lakes in the Hebrides, and some spots in the south and west of Ireland, being found nowhere else in Europe, though it also occurs in Canada; the trifid-leaved cinquefoil (*potentilla tridentata*) is found only on one hill in Angus-shire, which is its sole European station; but is abundant in Arctic America, and particularly on the Rocky and White mountains.

Some plants reach their northern limits in the south of England and Ireland. Among these, stands conspicuous the *arbutus*, or strawberry tree, which flourishes especially in the neighbourhood of the Lake of Killarney, where this beautiful tree attains a great size. The Cornish heath grows nowhere

in Britain except in Cornwall. As an indigenous plant, the sweet violet scarcely reaches the middle of the kingdom; and Scotch bards, instead of celebrating the deep blue violet, sing of "the violet pale." The northern and Alpine districts, on the other hand, are not wanting in their peculiar indigenous species, whose range does not extend to the south of the island: such are the Scottish primrose, alpine gentian, &c. Some plants, again, are confined to the eastern, and others to the western districts of the island; the plants of the eastern coast, having generally the character of those which are natives of dryer and warmer climates. The flora of the country round London is, perhaps, not surpassed throughout the whole of England. Surrey is particularly rich in orchideous plants, which also occur plentifully in Kent. They are found, though less frequently, in Essex and Middlesex; but are in great quantities in some parts of Hertfordshire. Kent and Surrey also contain many other rare plants.

Ireland, again, exhibits a few striking peculiarities in some of its vegetable productions. Besides the arbutus, already alluded to, it can boast the large-flowered butter-wort, (*pinguicula grandiflora*,) a beautiful flower, also a native of France and the Pyrenees; the graceful menziesia, indigenous both in the latter locality and in Spain, but found growing wild in no other part of the world; the London pride, or kidney-leaved saxifrage, also, which is scarcely known to exist, except in this locality and in Switzerland and the Pyrenees; the yellow poppy, a peculiarly arctic plant, unknown elsewhere in Europe, but plentiful on the northern extremity of America, and in Greenland, &c. The Irish yew and Irish furze are considered to be peculiar to Ireland; and to these the Irish broom is added by some botanists.

The trees which appear to be aboriginal natives of Britain, are the oak, (two species, the elm, (five species,) the beech, ash, maple, and sycamore, hornbeam, lime, (three species,) alder, birch, poplar, (four species,) aspen, mountain-ash, yew, holly, and pine, or Scotch fir. To these may be added, though of less importance as timber trees, the willow, white-thorn, crab-apple, blackthorn, hazel, guelder-rose, bird-cherry, elder, &c.



British Oak. — *Quercus robur*.

In regard to the height above the level of the sea at which some kinds of plants will thrive, it will be evident that the southern and midland parts of Great Britain do not contain mountains, or land of sufficient elevation, to afford any striking illustration of this natural distribution of plants; and if we find some of the higher lands on the southern coast devoid of trees, it may rather be attributed to their exposure to sea winds, and, perhaps, the want of congenial soil, than to elevation above the sea level. In the north of England, however, the case is different: the mountains there rise to the height of three thousand feet, and an opportunity is afforded of observing the limits of various species.

The finest oaks are met with in the southern districts of Great Britain, especially in Sussex and Kent, the noble oaks of these counties being regarded as the best timber for the use of the navy.* In the north of England, about lat. 55°, the oak still attains a large size in the valleys, but becomes of stunted growth on the hills at the elevation of sixteen hundred feet; and in Scotland, except in some of the valleys in the south, it generally forms only copse woods. The common elm is not indigenous north of the Tees, its place being supplied by the wych elm, which skirts the mountains at the elevation of two thousand feet. The beech, which forms vast forests in the south of England, also flourishes in the low sheltered valleys in the north, but does not grow on the hills to the same elevation as the oak. The linden, or lime-tree, one species of which appears to be indigenous to the counties bordering on Wales, and another in Lincolnshire, scarcely reaches the northern districts of England. Holly-trees are among the chief ornaments of the woods of Northumberland, Cumberland, and Durham, in which counties the yew is also abundant. On the other hand, the birch attains a greater size in the north of England than in the southern counties, almost equalling in appearance the birches of Norway and Sweden. In Scotland, however, it becomes stunted at eleven

* The annexed cut is from an original drawing of Sir Philip Sidney's oak, in Penshurst Park, Kent. In this view of the tree, a specimen occurs of the peculiarly-formed diverging branches, to which the term knee-timber has been applied; at one period, in great request in naval architecture.

hundred feet above the sea. It is accompanied by the sycamore-maple and mountain-ash. The dwarf willow grows on the summit of the loftiest Cumbrian mountains, more than three thousand feet above the sea-level. The pine, or Scotch fir, is a native of Scotland, but is no longer indigenous, or even capable of successful cultivation in South Britain; though from the roots and trunks of very large pines discovered in the peat-mosses on the elevated moors in Cumberland, there is reason to suppose that at some former period it was a native of those districts. This tree constitutes noble forests in the mountainous districts of Scotland, filling the valleys, and affording many specimens of trees attaining towering and magnificent dimensions. In some parts it extends to a considerable elevation on the mountains, but in others, ceases to be of value beyond the elevation of 1050 feet above the sea.

The cerealia cultivated in Britain consist of wheat, rye, oats, barley, and bigg, or bere, a hardy species of barley. It has before been remarked, that wheat will not ripen further north than Inverness, and there, only in valleys near the level of the sea: in the north of England, its successful cultivation extends to about 1000 feet above the level of the sea; whilst oats succeed at about double that elevation, and potatoes may be cultivated at the same elevation as oats.* In Scotland, in latitude 57° , however, oats will not come to perfection beyond 950 feet, and barley-bigg ceases to flourish beyond 1050 feet above the sea.

Our native fruits are few in number. Among these, the principal are the strawberry, raspberry, red and black currant, and gooseberry, all of which are improved by cultivation. The latter fruit appears to arrive at greater perfection in the northern parts of the island, particularly in Aberdeenshire, where gooseberries are said to be peculiarly delicious, far surpassing those of the southern parts of the island. The hazel is indigenous, and grows wild in Scotland, where, in lat. 57° , it ripens its nuts well at the elevation of five hundred feet

* It is a remarkable circumstance, that when the soil of the moors in this part is ploughed for the first time, and lime applied, white clover comes up in abundance. The same has been observed in North America, when the woods are cleared away, and the ground broken up.



The Scotch Fir.—*Pinus Sylvestris*.



above the sea. The apple, pear, medlar, plum, and cherry, are also natives, but require cultivation to render their fruits of any value. All these, with the exception of the medlar, succeed in favourable situations as far north as Inverness. The chesnut is a doubtful native, and only succeeds in the southern parts of the island; to which the vine, fig, mulberry, quince, and walnut, are chiefly confined, though they sometimes, under auspicious circumstances, extend to the middle of the kingdom. The period of the introduction of some of the above species is involved in much obscurity; for history informs us that our Saxon ancestors cultivated almonds, figs, and grapes; but the two former appear to have been unknown at a later period, and to have been re-introduced towards the close of the sixteenth century.

Fauna of the British Isles.—The progress of cultivation and civilization, and especially the commercial intercourse of Great Britain with foreign nations, has undoubtedly effected a vast change in the fauna of the British Isles. The number of species which have become extinct may not perhaps be great, being probably confined to the larger animals, such as the bear, the wolf, and the wild boar. But among the insect tribe, there can be little question that a considerable number have been introduced with the plants which form their station. The dormant state in which insects remain, both in the egg and pupa, or chrysalis state, greatly facilitates their transmission from one region to another; and some species may perhaps have become so naturalized, as almost to be regarded as aboriginal inhabitants. Ten thousand species are now known to inhabit these islands; and it is more than probable that a considerable proportion of these consist of imported species—a supposition which may account for this unusually large number, considering the chilly nature of our climate.

The radiated animals of the British Islands include the sertul lariæ, flustræ, actinia, or sea anemone, starfish—

And those live lucid jellies which the eye
Delights to trace, as they swim glittering by.

We have few native species of corals; the most remarkable is the May-blossom coral, (*caryophyllia ramea*,) which is, however, rare, and apparently confined to the coasts of Cornwall.

It is said to retain for many years a slight scent, resembling that of the hawthorn, whence its name. It is common in the Mediterranean.

Our native molluscous animals, though not remarkable for their beauty, are nevertheless numerous, and not devoid of interest. The most valuable, on account of its utility as food for man, is the oyster: the most beautiful perhaps are some of the varieties of the *pecten opercularis*, which are used as food in the west of England. Ireland possesses many species unknown on the coasts of England.* The *isocardia cor*, or heart-cockle, is not unfrequently met with in the Bay of Dublin. Our rivers and ponds abound in freshwater species; among which the most remarkable is the *unio margaritifera*, from which our native pearls are obtained. Little as these pearls are esteemed in the present day, they were included by the Romans among the productions for which Britain was celebrated. The ancient British pearl fishery was carried on in the Welsh rivers; but the *unio margaritifera* is at present chiefly found in the rivers of the north of England and of Scotland.

The reptiles of Britain are very few, and in general harmless; the common viper, called also the adder, being the only venomous species. The snakes and the blind-worm are innoxious, and besides these, we only possess two kinds of frogs, two of toads, and a few lizards.

Among our native birds, the golden eagle ranks foremost, being the largest as well as most splendid of the feathered inhabitants of these islands. This bird, though driven from many of its ancient haunts, is still found among the highest of our Welsh and Cumbrian mountains, and also in the Orkneys. The erne, or sea-eagle, is chiefly met with on the steep cliffs which border the ocean in Wales and Scotland. The osprey and falcon are becoming rare. The crane, the egret, and the heron, are also very scarce, though they still frequent some parts of the kingdom. The British owls are similar to those of continental Europe. The principal native

* Several West Indian shells, as well as seeds, are frequently found on the coasts of Ireland, apparently carried thither by currents; these, however, cannot be included among its native species.

song-birds of Great Britain, though these are by no means confined to this island, are the blackbird, thrush, linnet, goldfinch, bulfinch, chaffinch, dunnoek, or hedge-sparrow, golden-crested wren, common wren, robin redbreast, and the lark—

Ethereal minstrel ! pilgrim of the sky !
Type of the wise, who soar, but never roam,
True to the kindred points of heaven and home.

These islands, especially in the southern districts, are, during the summer months, visited by various migratory birds, amongst which the nightingale and black-cap are very conspicuous as song-birds ; whilst the swallow tribe, from their number and the peculiarity of their habits, form objects of general interest. In the winter months, their place is supplied by the field-fares and starlings ; and all these birds, as well as the rooks, creepers, titmice, and even the common sparrow, as well as many others, are of great utility in keeping under the swarms of insects, which, but for this check upon their too great increase, would multiply to so vast an extent, that they would ere long destroy all the fruits of the earth. The stock dove, the cushat dove, ptarmigan, grouse, and partridge, also rank among our native birds. The capercalzie is supposed to have become extinct ; and the bustard and quail are very rare. The manner in which birds follow cultivation is exemplified in some of our British birds. Thus, the cross-bill is said to have followed the introduction of the cultivated apple into England ; and the partridge was never known in Glencoe, until the cultivation of corn was introduced into that valley.

The pheasant, now almost naturalized, was originally brought into this country from Asia Minor. Our domestic poultry, as is well known, has been introduced from various parts of the globe : the peacock and common fowl from India ; the guinea fowl from Western Africa ; and the turkey from North America.

The British mammalia consist of about sixty species, independent of those which have been extirpated from these islands. We have nine species of bats ; various species of rats and mice ; the hedgehog, which is an innoxious animal, and of great utility in destroying snails ; the mole, whose little hillocks, though they disfigure rich pastures, tend greatly

to improve poor land; the dormouse; the badger, and the otter, which are now becoming rare. The larger carnivorous animals have been nearly exterminated; the only animals of this order now found in Britain, consisting of the fox, wild-cat, and the weasel tribe; among the latter are included the polecat, martin, and stoat. The stoat perhaps forms one of the most striking instances of the variation which takes place in the garb of some animals, with a change of climate. That animal, on account of its destructive habits, is regarded in this country as one of the greatest pests of the farmer, and its thin fur, of a yellowish brown colour, being considered of no value, the despised skin may frequently be seen nailed up against the farmer's outbuildings, as a trophy, or a scare-crow. The same species of animal also inhabits various parts of continental Europe; being in the more temperate regions, similar in appearance to our stoat, but, in its northerly range of Russia, Norway, and especially Siberia, the coat of the animal is transformed into a beautiful thick fur, adapted to protect it from the severity of the climate, of a clear white in every part, except the tip of the tail, which is deep black; and under this form it affords the well-known fur called ermine, which name the stoat bears in the northern regions. This animal may occasionally be seen in an intermediate state, between summer and winter clothing.

Our native horses, of which the Welsh and Zetland ponies may be considered as representatives, are small, but esteemed for their activity and strength.

The dogs of Great Britain have been celebrated from remote antiquity; our mastiffs having been in great request with the Romans, who used them in their ferocious combats of wild beasts. The blood-hound was held in high estimation by our ancestors, as a means of tracking their enemies; but the race appears to be extinct. Scotland possesses three species of native dogs: the Scottish greyhound, the Zetland hound, and the colly or true shepherd's dog—

There still, of genuine breed, the colly meets,
Barking shrill-toned, the stranger rarely seen.

The Irish greyhound is a powerful dog, but is nearly extinct.

The list of British ruminating animals is very limited, being

confined to the stag, or red deer, the fallow deer, the roe-buck, and the almost exterminated urus, or wild Scottish ox. The excellent varieties of domestic oxen and also of sheep, which have been introduced, amply compensate, however, for any deficiency in this respect. The black-faced horned sheep appear to be the most ancient race in our island, and these are still met with in some parts of Yorkshire and the adjacent counties.

The marine and cetaceous mammalia of Great Britain are not numerous. The principal are the seals, which are inhabitants of the northern parts of this island, and of the western shores of Ireland; and the grampus and porpoise, which have a wider range, being met with in considerable shoals off all our coasts. The whale tribe probably in former times were more abundant than at present. The piked whale, bottle-nosed whale, and others, are, however, not unfrequently met with in our northern seas, and are occasionally cast on the coasts of the Zetland and Orkney islands, as well as the Hebrides, and the north of Ireland: in some instances, in unfavourable seasons, to the no small relief of the distressed inhabitants. The walrus and the manatus have been seen in Scotland; but perhaps may rather be regarded as visitors than natives.

The wolf, the bear, the beaver, and the wild boar, are extinct in these islands. Wolves existed in Ireland at a comparatively recent period, some having been killed in that country as late as the year 1710; nor were they wholly extirpated from Scotland until the year 1680. It is a commonly received opinion, that wolves were totally destroyed in England and Wales in the reign of Edgar. It appears, however, that they cannot have been wholly exterminated at that period; (unless indeed they may have subsequently spread into South Britain from Scotland;) for in the reign of Edward I. we are informed that wolves were in such number, that officers were appointed to effect their complete extermination. Bears probably were anciently very numerous in this island, from whence they were transported to Rome; they also formed objects of chase in Wales. The exact period of their latest existence in Britain is not known, but

they are recorded to have infested Scotland in the year 1057. The beaver was an inhabitant of Wales in 1168, though it is supposed at that period to have been confined to the banks of the River Teivi. The wild boar has given place to our domestic races of swine, as the wild ox has to our domestic oxen; but it appears that, in the eleventh century, a vast forest occupied the north of London, which was the resort of stags, fallow-deer, and wild boars. Some of the ancient red-coloured swine may, however, still be seen in a half-wild state in the New Forest.

CHAPTER XI.

THE OLD WORLD.—CENTRAL BAND OF MOUNTAINS,—THE
PYRENEES.—SPAIN AND PORTUGAL.—FRANCE.—
THE MARITIME ALPS.—ITALY.

Like as a ship, that through the ocean wide
Directs her course unto one certain coste,
Is met of many a counter winde and tyde;
Yet making many a borde and many a bay,
Still winneth way, ne hath her compass lost:
Right so it fares with me in this long way,
Whose course is often stayed, but never is astray.

SPENSER.

THE Old World, including Europe, Asia, and Africa, first claims our attention. A remarkable band of mountains traverses this vast continent from west to east throughout its whole extent, commencing on the shores of the Atlantic, near Fuentarabia, or Fontarabia, in Spain, and terminating on the shores of the Pacific, with the volcanic island of Formosa; the whole length of this mighty band being little less than eight thousand miles, and its breadth varying from five hundred to two thousand miles. Although this range is not altogether continuous, it is sufficiently so for us to regard it as our *central axis*, or *stem*, along which to take our general course, and from which we shall find lateral branches, of greater or less importance, diverging in all parts.

The situation of this vast mountain band, about midway between the equator and the north pole, considerably influences the climate of the extensive regions through which it passes; whilst, at the same time, it forms a separation between the warm and fertile countries of southern Asia, and the less genial northern regions of that portion of the earth. In ancient times, it constituted the boundary-line between the civilized nations and the barbarous tribes of Europe; and although the aspect of these territories is now wholly changed in this respect, it is worthy of remark, that in its extension through Asia, this mountain band to the present day divides the more civilized nations of India and Persia, from the uncivilized hordes which still occupy almost the whole extent of the northern regions of Asia, spreading from the borders of China to the Sea of Azof. Indications, however, are not wanting, that some portions of the latter territories were at one period the seat of learning and civilization; perhaps, indeed, that of the earliest on the face of the globe.

In Western Europe, this mountain band commences under the name of the Pyrenees. The scenery in the central part of the Pyrenees is magnificent, presenting the most numerous and concentrated assemblage of elevated summits in Europe.

Chasms of the early world are yawning there,
And rocks are seen, craggy, and vast, and bare,
And many a dizzy precipice sublime.

The highest peaks are Maladetta and Mont Perdu. The deepest valley in Europe, said to be no less than three thousand one hundred feet in depth, is that of Adessa, near Mont Perdu. The passes in these mountains are locally termed *ports*, and are in some parts so dangerous, that it is proverbially said, "the father never waits for his son, nor the son for his father." In the midst of these rugged mountains, however, fertile spots are of frequent occurrence, to which the shepherd conducts his flocks in the summer months.

Lateral branches diverge from the Pyrenees, both to the north and south. Those which enter Roussillon and Gascony, are neither extensive nor lofty; but those which extend into Spain and Portugal, form long and elevated ranges of mountains, rendering the surface of those countries strikingly irre-

gular. Physical Geography, we have already remarked, does not take into account the artificial or political divisions of the earth; and thus Spain and Portugal, being separated by no natural barrier, form only one region—

Where Lusitania and her sister meet,
Deem ye what bounds the rival realms divide?
Ne river deep and wide,
Ne horrid crag, ne mountain dark and tall.
But there between a silver streamlet glides:
And scarce a name distinguisheth the brook,
Tho' rival kingdoms press its verdant sides.

One of the leading southern branches from the central range is the Cantabrian range, which stretches across the whole northern coast of Spain, leaving only a narrow and rugged tract, intersected, however, by some fertile valleys, between the mountains and the sea. Another principal branch is the Iberian range, which diverges at right angles from the Pyrenees, and extends southwards nearly through the whole of Spain. From this range various collateral branches again diverge, generally taking a south-westerly course. Of these, the most northerly is the rugged and romantic Castilian range, which extends into Portugal, where it bears the name of the Sierra Estrello. The other collateral branches are the Sierra of Toledo, the Sierra Morena, and the Sierra Nevada. The latter range contains the most elevated summits in Spain. The line of perpetual snow in this latitude reaches the height of about ten thousand feet above the sea; and, as many of the summits in this range exceed that elevation, and some are more than eleven thousand feet in height, the tops of these mountains are covered with perpetual snow. Mulahacen, the most lofty, is 11,673 feet, and Veleta is 11,398 feet, above the sea-level.

A plain of singular beauty and fertility, called the Vega, intervenes between the Sierra Nevada and the Mediterranean Sea.

Thou land of love and loveliness, what dreams
Of pomp, and beauty, and old chivalry
Haunt the green borders of thy silver streams!

In the heart of the Vega stands the city of Granada, the situation of which is celebrated for presenting a remarkable combination, of all that is most wild and sublime in natural

scenery, with whatever is soft and beautiful. A romantic interest also attaches to the spot, enhanced by the striking appearance of the splendid city, crowned as it is by the Alhambra.

Palace of beauty! where the Moorish lord,
King of the bow, the bridle, and the sword,
Sat like a genie in the diamond's blaze!

The whole country in the south of Spain presents a highly rich and varied vegetation, resembling rather that of Syria than of Western Europe. The long sojourn of the Moors in this territory, and also the subsequent communication of Spain with the New World, led to the introduction of numerous exotic plants, the natives of Africa and of intertropical America, which have become almost naturalized, and are here seen uniting their peculiar foliage with that of the most valuable and beautiful European species. Here grow the chesnut, cork (fig. 82),* ilex, cypress, bay, myrtle, carob, or eastern locust tree, (considered the most beautiful of European trees,) the vine, orange (fig. 43), lemon, olive (fig. 138), fig, pomegranate (fig. 17), mulberry, pistachio, or pistacia terebinthus, laurustinus, cistus, caper plant, and various others, accompanied by the date, dwarf-palm, American aloe, cactus, sugarcane, convolvulus batatas, or sweet potato, and even the banana, or plantain. Oaks, beeches, and lindens or limes, occur only on the declivities of the mountains. The extensive plateaus, or table-lands, which occupy the centre of the kingdom, present a totally different aspect, being in general destitute of trees, and far from productive. In the lowlands, near the coast, however, the orange succeeds as far north as Oporto, lat. 41° , and the olive to lat. 42° . The fine plains of Valentia, again, which border on the Mediterranean Sea, are remarkable for their fertility and their abundant produce of corn, wine, oil, and silk. The fruitful valleys situated in the tract lying between the Cantabrian mountains and the sea experience a very different climate. Independent of the more northerly latitude of this region, the situation of its principal mountain range tends greatly to produce this effect; for,

* To avoid repetition, when the figure of a plant is referred to, Plate IV. will be understood as inferred.

instead of protecting it from the North, the Cantabrian mountains extend along its southern border, and though the north winds are tempered by crossing the ocean, its difference of climate is marked by its different vegetable productions; the apple-tree here taking place of the olive and the vine. The whole of Spain affords a striking illustration of the influence of climate on vegetation, and of the effect produced on temperature by the elevation of land, and the relative position of mountain ranges.

The native animals of Spain are little known. The most remarkable appear to be the Alpine squirrel, which is peculiar to the Pyrenees, and the ibex, which inhabits both that range and the Cantabrian mountains. The spaniel is considered a native of Spain. The celebrated merino sheep are said to have originated from the English sheep, some of which were sent to Spain as a present from Edward IV. to King John of Arragon.

The mountains of Spain are rich in minerals, among which may be mentioned, as the most remarkable, the excellent iron ore of Biscay, the mighty lead veins of Linares, the enormous deposit of the same mineral in the Sierra of Gador, and the rich mercury mines of Almeida. Rock-salt occurs in vast masses, especially at Cardona: it is also abundant in Portugal. Coal deposits are known in various parts of Spain; the most important appears to be one occurring in Asturias. The rare deposit called meerschaum is found near Madrid, and in other parts of Spain. Near Almeira, in Granada, is the remarkable rock of Filabres, which consists of a single block of white marble, two thousand feet in height.

Returning to our central axis, we next meet with the low range of the Cevennes, which may be considered as its continuation; though, in fact, they are separated from the Pyrenees by the valley through which the canal of Languedoc extends. These mountains stretch in a winding line along the left bank of the river Allier, parallel to the coast of the Mediterranean. The highest point in this range is Mont Mezene, which is nearly six thousand feet above the sea. The Cevennes are very steep and difficult of access, but were nevertheless passed by Julius Cæsar in the winter, through snow six feet deep.

In later times, these mountains afforded shelter to the Huguenots.

The mountains of Auvergne branch off from the Cevennes, and extend into the very centre of France. They consist, in great measure, of a group of ancient volcanos, supposed to have been extinct long before the recent period. Among these, the most conspicuous is Mont D'Or, which rises suddenly to the height of some thousand feet above the surrounding country, still retaining the form of a cone, though no regular crater can now be traced. The summit of this extinct volcano is 6707 feet above the level of the sea.

A branch from the great Alpine system separates France from Northern Italy and Switzerland. Some of the summits in this part are of considerable elevation, exceeding fourteen thousand feet; such are Luceira and Lupillon. The Jura mountains may be considered as a continuation of this branch, and the whole country on their western flanks is remarkable for its wild and picturesque character. These mountains, which are chiefly composed of limestone, are broken into the most peculiar and romantic forms; and some remarkable caves and grottoes occur, particularly those of Sassanage. Among the wildest and most forbidding of these rocks, stands the monastery of La Grande Chartreuse. The Vosges mountains, and others of inferior elevation, branch off from the Jura, constituting the eastern boundary of Northern France.

The centre of France is occupied by a table-land or plateau, of considerable extent; but the greater portion of the country, including the whole of the northern, and a large portion of the eastern districts, may be regarded as one widely extended plain, forming part of the Great European Lowland.

The vegetation of some parts of France nearly corresponds with that of Britain; and its mountains, although they possess some species peculiar to themselves, exhibit most of our Alpine plants. The northern lowlands admit of the successful cultivation of all the fruits and products of the lowlands of England, but, owing to the higher summer temperature of France, in greater perfection than with us. The southern and eastern districts, however, possess a very different climate; and there,

in place of wheat, grows the maize, accompanied by the vine and the olive.

The most northerly successful cultivation of maize differs in the eastern and western districts of France, extending in the eastern parts as far north as Strasburg, and not reaching beyond the mouth of the river Garonne in the western districts. A similar difference is observable with the vine, which, in the eastern districts, extends in full perfection to the country near Mézières, but in the western districts, not beyond the mouth of the river Loire.

We have already seen that the inland districts of any region usually experience more severe winters and hotter summers than those bordering on the coast; to this cause may be attributed the more northern range of these plants in Eastern France. The maize being an annual, cannot be affected by the severity of the cold; but it will be remembered that it requires a high summer temperature to ripen well. The sap of the vine, again, is in a quiescent state in the winter, and is therefore protected from the frost, but a considerable degree of heat is required to impart richness to the fruit. The cultivation of the olive is chiefly confined to a tract lying between Narbonne and Grenoble, which appears to form its extreme northern limit.

A still warmer climate prevails on the borders of the Mediterranean, where the pomegranate, pistachio, jujube, fig, and mulberry, arrive at great perfection, and where, also, on the extreme borders of France, we first meet with the dwarf palm, this being its most northern limit. Oranges, however, can scarcely be cultivated without shelter in any part of France.

France, besides possessing many native species, unknown as inhabitants of Britain, includes amongst its wild animals most of the species we have enumerated as extinct in our island. Thus, the wolf (fig. 23)* is still not uncommon in the wooded and mountainous districts; and bears, though now diminished in number, were at one time numerous. The beaver is said to inhabit the southern parts; and the wild boar still frequents

* When the figure of an animal is referred to, Plate VI. will be understood as inferred.



Maize.



The Olive.

some of the forests. This country possesses some beautiful birds; such as the gross-beak, blue-throated warbler, &c.; and also numerous insects, rarely, if ever, seen on our shores. The total number of known species of insects in France is about 15,000; the number of indigenous plants about 7400: it will therefore be perceived that the proportion of insects to plants is not so great as with us.

The mineral treasures of France are very considerable, and also very generally diffused throughout the country, Gers being the only department which does not in some way contribute to its mineral wealth. There are numerous coal fields in various parts of France, and iron occurs very abundantly, though the produce falls greatly below that of England. France also possesses mines of copper, of lead mixed with silver, of antimony, &c., but none of these are of great importance. Some considerable beds of rock-salt occur at Vic, in the department of Meurthe.

Returning to our central axis, we find it prolonged in the leading range of the great mountain system on which the name of Alps has been bestowed.

These mountains are usually divided into nine groups; and although no natural division may occur, it will be convenient to treat of them under these heads. They consist of, 1st, the Cottian; 2nd, the Graian; 3rd, the Pennine; 4th, the Helvetic; 5th, the Rhetian; 6th, the Noric; 7th, the Carnic; 8th, the Julian. The 9th group, called the Maritime Alps, does not belong to the central band, but may be regarded as a branch diverging from that line, taking a southward course from Monte Viso; whilst the Cottian Alps, which form the first continuation of our central axis, and which also commence with that splendid mountain, take an opposite course.

Ere proceeding along our central line, it will be desirable to turn our attention to the important branch, called the Maritime Alps; an appellation, however, which is soon exchanged for that of the Apennines. These mountains, under the name of the Ligurian Apennines, first encircle the Gulf of Genoa; then taking a south-easterly course, they extend through the whole of Italy, the form of which corresponds strikingly with its mountain system. The slopes or declivities of the Apen-

nines present, on either side, valleys and plains of the greatest beauty and fertility.

Thou Italy ! whose ever golden fields
Ploughed by the sun-beams, solely would suffice
For the world's granary : thou, whose sky Heaven gilds
With brighter stars, and robes with deeper blue :
Thou in whose pleasant places summer builds
Her palace !

The summits of the Apennines differ in appearance from the rugged Pyrenees, and sharp-pointed Alps, being usually of a rounded form, and not of very great elevation, the highest not exceeding nine thousand feet above the level of the sea. Low undulating hills (known to geologists as the Sub-Apennines) skirt the northern slopes of the Ligurian Apennines, and cover a considerable extent of country on both sides of the Etruscan and Roman portions of this range. Perhaps, however, the most important feature in Italy is the volcanic district, which is almost confined to the central parts of the western side of the peninsula ; and near the southern extremity of which, we meet with the energetic volcano of Vesuvius. To this district we shall have occasion to refer in a future page.

The valleys and lowlands of Italy are no less celebrated for their beauty and fertility, than for the classical and poetical interest with which they are invested. The extensive plains of Lombardy are considered as the richest and most fertile in Europe, and the valley of Naples is celebrated for its highly beautiful and picturesque scenery ; but perhaps they both yield to the vale of Tuscany :—

The brightness of the world, O thou once free
And always fair, rare land of courtesy—
O Florence, with the Tuscan fields and hills !
And famous Arno, fed with all thy rills,
Thou brightest star of star-bright Italy !

Some part of the Roman territory is picturesque and fertile ; but a considerable portion is occupied by a swampy waste, called the *maremma*, whose pestilential influence renders that district uninhabitable at certain seasons of the year. On the eastern side of the peninsula, the Apennines approach nearer to the coast, sending forth spurs, or inferior branches, which present their bold cliffs to the Adriatic Sea. Nearly parallel with Naples, however, a subordinate peninsula juts out, still

known by the classical appellation of *Magna Græcia*, once the seat of the highest civilization, and whose capital, Tarento, was at one period a rival to Rome. This territory, little conspicuous as it is at present in the annals of Europe, contains plains which are described as of almost unrivalled beauty, finely diversified, and adorned with the richest groves of orange and citron. Some singular and beautiful caverns occur in the vicinity of Polignano.

The mountains of Sicily form a continuation of the Apennines; to this, however, Monte Gibello, or Mount Etna, may be considered as an exception, for this volcanic mountain, which is situated near the borders of the sea, rises in solitary grandeur to the height of nearly 11,000 feet, the mass being chiefly composed of volcanic matter. The Lipari Islands, to which group Stromboli belongs, are all of volcanic formation. The island which bears the name of Lipari is remarkable for its splendid display of the beautiful volcanic glass, called obsidian, and for its profusion of pumice; the pumice of commerce being principally obtained from that island. The island of Malta is not volcanic, but wholly composed of tertiary rocks, the highest point being only 590 feet above the sea.

The vegetation of Italy and Sicily is rich and varied, uniting most of the productions of temperate Europe with those of warmer climes. Thus, in Sicily, by the side of the plane, poplar, and willow, grow the cactus, orange, and lemon (fig. 44), the olive, myrtle, laurel, carob tree, and promegranate; whilst the arbutus and tamarisk abound on the coasts. Here also are cultivated the date, custard apple, and sugar cane, whilst at the same time the wheat of Sicily is reckoned some of the finest in Europe. The elevated cone of Etna affords an instance of the variation in vegetation as we ascend above the level of the sea. This is divided into three zones, the fertile, the wooded, and the barren. The first zone, which consists of the country at the base of the mountain, is covered with aromatic herbs, olives, vines, orange trees, and all the fruit trees peculiar to this climate; the second, or wooded, besides affording excellent pasturage, abounds with cork, chesnut, beech, ash, oak, pine, and other trees; birch having the highest range. Beyond this, the desert region succeeds;

which consists of a waste of black lava and scorix, forming a kind of plain, only varied in a few instances by the sombre green of a species of broom. The principal cone of the volcano rises from this plain, and is about 1100 feet in height. Numerous smaller cones are scattered over the sides of the mountain, and many of these being beautifully wooded, they greatly contribute to the picturesque appearance of the mountain.

The vegetation and climate of Calabria much resemble those of Sicily. The summers are excessively hot, and frost is scarcely known. The soil is remarkable for its fertility, and the valleys are abundantly watered by the streams which flow down from the singularly wild and rugged, though picturesque, mountains. In the warmer parts, there are large groves of orange and lemon trees, and of the red and white mulberry;* whilst the otherwise barren rocks are covered with the agave, cactus, and caper plant, which latter forms an object of commerce of considerable importance. The slopes and eminences produce the olive, pistachio (both *terebinthus* and *lentiscus*), jujube, oleander (on the borders of the streams), dwarf palm, carob, manna-ash, cypress, bay (fig. 119), willow, &c., and also the Italian poplar (fig. 111), and the *pinus pinea*, or stone pine, whose picturesque and dark foliage forms such a peculiar feature in Italian landscapes. The mountains, again, are clothed from the base to the very summit with chesnut (fig. 80), cork, oak, horse chesnut, yew, larch, Scotch fir, and other trees. Most of the vegetable productions of the Calabrian plains are met with in the line of coast at the base of the mountains, but it is only in the southern part of Italy that the Apennines can boast of this rich vegetation; in the more northern districts, the summits and upper portion of this range are destitute of trees; a circumstance, however, not so much to be attributed to the difference of latitude, as to their greater elevation above the level of the sea. The climate of Italy is peculiarly favourable to the growth of the vine and the olive. Owing to the excessive sweetness of the grapes, the wines are, however,

* The mulberry tree does not appear to have been introduced into Italy before the twelfth century.

generally luscious. The superiority of the olive oil of Western Italy is well known. That particular kind known as Gallipoli oil,* is the produce of the eastern region, called *Magna Græcia*. Maize and millet are very generally cultivated throughout Italy, though by no means to the exclusion of wheat. Rice, as has been already mentioned, is successfully and extensively grown in the plains of Piedmont; and the sugar-cane and cotton plant come to perfection in



The Cotton Plant.

Calabria, of both which plants this may be considered as the northern limit of successful cultivation. Among its grasses, Italy produces one of those gigantic species so characteristic of warmer regions; this is the *arundo donax*, which seems to take the place of our common reed, and of which, canes, fences, and other articles are made.

* This oil is held in high estimation for the manufacture of fine woollen cloth.

The island of Malta (an object of interest, on account of its having been the scene of St. Paul's shipwreck) is not naturally fertile, but, by careful cultivation, yields grain, cotton, and excellent fruit, especially oranges.

The native quadrupeds of Italy include the wolf and the wild boar. The porcupine is supposed to have existed formerly in Sicily, but is now extinct. Malta, like most other small islands, does not contain any native quadruped larger than a rabbit, and probably even this animal has been introduced. Among the most remarkable birds of Italy, are the rose-coloured starling, (one of the most beautiful European birds, not, however, confined to Italy, being met with in other parts of Europe, and having been occasionally seen in Britain); the blue thrush, which, like our less ornamented thrush, is a sweet songster; the hoopoe; and the crimson-winged wall-creeper. The migratory birds of Sicily are interesting from their including many species common to the opposite shores of Africa. Besides the immense flocks of quails, which pass over this island in the spring, bee-eaters, rollers, orioles, and hoopoes, are very numerous; whilst in the marshes are seen the African flamingo, the pelican, the beautiful purple heron, the glossy ibis, and other species, rare in Europe. Quails are also very abundant in Malta, where the beautiful merops, the golden oriole, and the elegant crested hoopoe are met with. The little solitary island of Lampidosa is remarkable for being the habitual residence of the most elegant of European birds, the coronated or crowned crane (*ardea pavonia*).

Among the insects of Italy, the tarantula spider is perhaps the most noted; recent naturalists, however, entertain doubts of the virulence of its poison. The scorpion occurs in Italy: and a species of termites, or white ant, inhabits Sicily. The insects of the latter island are very numerous, and comprise some well-known African species, among which is the scarabæus. Flights of locusts, almost unknown in the rest of Europe, have occasionally visited and devastated this fruitful island.

CHAPTER XII.

ALPINE SYSTEM.—SWITZERLAND.—THE GERMAN HIGHLAND. — CARPATHIAN MOUNTAINS. — DALMATIAN RANGE. — BALKAN MOUNTAINS. — GREECE AND TURKEY.

. The Alp
Of horrid snow, and rock, and shaggy shade;
Of desert-loving pine, whose emerald scalp
Nods to the storm.—BYRON.

WE now return to the Alps, which form so marked a feature in the natural geography of Europe. These mountains present neither the rounded outlines of the Apennines, nor the ruggedness of the Pyrenees, being generally more imposing in their form, and their summits being sharp, and in some parts pike-shaped or needle-shaped. The latter term is locally applied to some of the peaks; as, for instance, Aiguille Blanche; others are locally termed horns, as Schreckhorn, or horn of terror; others again are designated by the term *spitz*, or peak, as Oertler-*spitz*.

The passes, which consist of the lowest passable routes over the various mountains, are, in the Alps, usually termed *cols*, or necks. The southern or Italian slopes of this range, are in general more precipitous than the northern, and it is chiefly on the latter side that offsets, or branches, diverge from the central line.

This mountain system does not spread into extensive table lands, but consists chiefly of vast ridges, in some parts running parallel with each other, and intersected by deep valleys, occasionally containing lakes of considerable size. The consequence of this great diversity of surface is, that a singular variety of climate occurs in this region. The snow-line in this latitude varies, according to local circumstances, from 9000 to 9500 feet above the level of the sea; and as a large number of the summits of this range considerably exceed that elevation, perpetual ice crowns their heights; whilst, on the declivities

of the mountains, and in some of the valleys, we meet with all varieties of vegetation, from that of arctic regions, to that of temperate Europe. The highest summit is Mont Blanc, 15,781 feet above the sea.

Mont Blanc is the monarch of mountains,
They crowned him long ago,
On a throne of rocks, in a robe of clouds,
With a diadem of snow.

Our course first lies along the *Cottian Alps*, which extend from Monte Viso, in a nearly northward direction, to Mont Cenis, a distance of about sixty miles. The only carriage route across this part of the Alps is that of Mont Genève, executed by order of Napoleon. Another route, though not passable for carriages, is by the valley of the Bardonneche, which is supposed to have been the pass traversed by Julius Cæsar, when he crossed the Alps to attack the Helvetii. The principal mountains in this division are Pelvoux and Olan.

The *Graian Alps* extend from Mont Cenis—which is included in this group—to the Col de la Seigne. The pass over Mont Cenis was known in the early times of French history; for it appears that Pepin, emphatically styled the “father of Charlemagne,” crossed this pass with an army, when he marched to attack Astolphus, king of the Lombards; it, however, in later times, was only a difficult mule road, until the present magnificent route was formed by Napoleon Buonaparte. The elevation of the pass is 6773 feet above the sea. Besides Mont Cenis, the principal summits in this group are Iseran and Vanoise.

The *Pennine Alps* take a north-easterly direction, extending from Mont Blanc to the Simplon. The country to the west of Mont Blanc, in the approach from Geneva, presents the grandest and most sublime Alpine scenery in Europe. The valley of Chamouni, the Glacier of Boissons, and the Mer de Glace, all contribute to produce this magnificent effect. The Pennine Alps form the loftiest portion of the whole range, and, besides Mont Blanc, include Monte Rosa and Mont Cervin, which rank among the most elevated peaks of Europe. The first great pass across this division of the Alps is that by the Great St. Bernard, which forms the route be-

tween Martigny and Aosta. This pass is of great antiquity, and has obtained modern historical celebrity, by the passage of Napoleon Buonaparte across it in the year 1800. To the eastward of the Great St. Bernard, is the pass of the Cervin, the loftiest in Europe, being 11,096 feet above the sea, but it is not passable for carriages. The magnificent route of the Simplon, another work of Napoleon, but now unfortunately falling to decay, is the most eastward in the Pennine Alps.

The *Helvetian*, or *Swiss Alps* (called also the *Lepontian*), next succeed, extending from the Simplon to Mont St. Gothard. This, and the preceding group, form the southern boundary of the deep and extensive valley named the Valais, through which the river Rhone flows, and which forms an instance of a principal valley. The Rhone, as well as the Rhine, both take their rise among the glaciers and perpetual snows of the Helvetian Alps.

Having traversed the central line to the boundary of Switzerland, it will be desirable to quit it for the present, and turn our attention to some of the branches which intersect that land of mountains and valleys. The principal of these is the range of mountains called the Jorat, which forms the northern border of the Valais, extending to the Lake of Geneva, of which it constitutes the steep and rocky northern shores. The peaks in this range are termed horns, and though none of the summits equal Mont Blanc in elevation, these mountains present a more imposing mass, and more continuous elevation, than even the range of the Pennine, or High Alps. The most conspicuous summits are Finster-aar-horn, Schreck-horn, and Wetter-horn.

The whole of Southern Switzerland affords scenery of the grandest and most pleasing description;—a succession of splendid mountains, intersected by deep and fertile valleys, which, being copiously watered by the streams which take their rise among these mountains, and also sheltered by the surrounding heights, enjoy a mild and humid climate, highly favourable to vegetation; and hence, in the more southern districts, the fig and olive come to perfection in the valleys, to the elevation of 1000 feet above the sea; the vine, to that of 1600 feet; the walnut extends to 2400 feet; the chesnut to

2800 feet; the oak, maple, and ash, to 3800 feet; the larch to about 6000 feet; and the Siberian pine to 6800 feet. The spruce fir grows at a greater elevation than any other tree, but this ceases to flourish at 7400, or about 2000 feet below the snow-line. The *rhododendron ferrugineum*, commonly called the rose of the Alps, extends to 7020 feet. Beyond the region of trees and shrubs, heath and furze are the principal occupants of the soil, though, in some parts, abundance of the more valuable product, Alpine grass, is met with; and beyond these plants, lichens and mosses alone occur. Among cultivated vegetables, wheat succeeds only in the sheltered and low plains; potatoes and barley generally thrive at the elevation of 4000 feet, and, in some favourable situations, 1600 feet higher, 5600 feet above the sea being considered the utmost limit of their culture. Buck-wheat is much grown, and, at the elevation of 2200 feet, it is sown after the rye crop is gathered in, and ripens, though in some places not until the snow falls. The plant cultivated at the greatest elevation is the *rumex alpinus*, a species of sorrel, grown for fattening swine, which succeeds at the height of 5900 feet.

The northern portion of Switzerland presents a different aspect to that of the southern districts, an extensive plain (comprehending the whole of the canton of Fribourg, and part of the cantons of Berne and Soleure) occupying the western region. In the eastern parts, however, we meet with some subordinate branches of the Alps, though no summits which reach the line of perpetual snow. The most remarkable among these are Mount Pilate, and Mount Righi, both situated in the Forest Cantons, a territory celebrated from having formed the scene of the exploits of William Tell. Mount Pilate rises in seven peaks round a little lake, concerning which a story is current among the peasantry in its vicinity, who believe that Pontius Pilate drowned himself in its waters. This fiction, however, appears to have originated in an error respecting the ancient name of the mountain, on the summit of which a cloud perpetually hangs, from whence the appellation of *pileatus*—i. e., covered with a cap, was bestowed on it; and this, in later times, being corrupted into Pilate, gave rise to the tradition.

The most remarkable native animals of Switzerland are the

ibex (fig. 100), and the chamois (fig. 88), both of which frequent the most inaccessible precipices of the Alpine range. The Alpine marmot is another inhabitant of these mountains. The bearded vulture, or vulture of the Alps, is peculiar to Switzerland. Its strength is so great, that even the ibex and chamois fall victims to its rapacity.

Returning to our central line, we next pursue the course of the *Rhätian Alps*, so named from the ancient *Rhætium*. This group extends from Mont St. Gothard to the Dreyhorn spitz. There are five good carriage roads in this division of the Alps; the first is by Mont St. Bernardin, which forms the route from the Lago Maggiore to the Rheinwald: the second, which crosses the Splugen, is the line of road from the Lake



Via Mala
M

of Como to the same point. These two routes unite at the village of Splugen, whence the road runs through the Via Mala and the finest Alpine scenery of the Grisons.

The elevated Oertler spitz is situated in this group, which also contains a considerable number of other lofty summits.

The *Noric Alps*, so called from the ancient Noricum, next succeed. These mountains form a lofty range in their western portion, and include among their summits the Grand Glockner. Towards their eastern termination, however, they are less elevated. Numerous passes occur in this division of the Alps.

The *Carnic* and *Julian Alps* may almost be considered as one group, the ramifications of this part of the mountain system being so complicated, that the separation is not well defined. These mountains cover a large portion of Illyria, and the scenery in this region is remarkable for the wildness and beauty of its character.

The number of mines worked in the Alps is not considerable, when compared with the extent of the mountains. Gold, silver, copper, lead, iron, and quicksilver, however, occur in some parts, and also anthracite. The most celebrated among the mineral deposits are the Bleiberg, or Lead Mountain of Carinthia, which furnishes some of the best lead in Europe; and the iron mines of Styria, equally noted for the superiority of their products. An amusing legend is current among the miners regarding the mines of Styria, the ancient Noricum. The Visigoths, at the period of the downfall of the Roman empire, having succeeded in expelling the Romans from this province, the genius of the mountains appeared to the new possessors, and thus addressed them:—"Make your choice;—will you have gold mines for one year; silver mines for twenty years; or iron mines for ever?" The legend proceeds to relate, that the hardy conquerors, having just practically experienced the superiority of their own rude iron weapons over all the gold and silver of the Romans, unhesitatingly accepted iron for ever.*

The Rætian and Noric Alps send forth branches to the

* See *Schloss Hainfeldt*, by Capt. B. Hall.

northward, covering Upper Austria with vast ranges, imparting to that territory a highland character, and presenting scenery of the most beautiful and romantic, though wild and rugged description. To the north of this mountain region lies the valley of the Danube, an elevated plain, or table-land, more than one thousand feet above the level of the sea. The northern banks of the Danube are bordered by a range of mountains, dividing this valley from the low plains of Germany, which form part of the great lowland of Europe. This range of mountains is connected with those of Bohemia, which may be considered as forming the termination of the highlands of Germany. These mountainous districts include "dark Hercynia's wood" (the Black Forest) in Swabia, the Sieben Geberge, or Seven Mountains, on the Rhine, the metalliferous group of the Erzgeberge, in Bohemia and Saxony, the Forest of Thuringia, and the "Lemur-haunted Hartz." None of the summits in these mountains reach the limit of perpetual snow, which in this latitude is about 6000 feet above the sea, the most lofty point being Schneekopf, 4950 feet in elevation, and the general height ranging between 3000 and 4000 feet. The Hartz mountains extend for more than a hundred miles along the borders of Hanover; the highest summit (which is included in that kingdom) is "Brocken's sov'ran height," from whence the eye descries—

Woods crowding upon woods, hills over hills,
A surging scene.

The Hartz mountains, as well as many others in this range, are exceedingly rich in ores. Coal also is very abundant in Westphalia, Saxony, Bohemia, Moravia, and other parts; but the most extensive coal fields are in Silesia. Salt is likewise found in great profusion.

One of the most remarkable natural features of the extensive region of which we have been treating, is presented by the caverns of Illyria, which are said to exceed one thousand in number, and many of which form the outlets of subterranean rivers, whilst others receive them. The most extensive cavern is that of Adelsberg, the entrance to which is by two large apertures, into one of which a river flows, accompanying the visitor for about a mile in his underground course, when

it plunges into an abyss, and is seen no more. At this point a double row of most magnificent caverns occurs, supported by pillars, and fretted with cornices of the purest stalactite; in some parts so beautifully arranged as to resemble the nave of a Gothic cathedral. This remarkable range has been penetrated to the length of six miles, where it terminates in a deep, clear, and cold subterranean lake.

The periodical lake of Zirknitz is another wonder of this territory. This lake is full in the winter and spring; but in the summer and autumn so entirely drained, that luxuriant crops of grass occupy its bed. The very extraordinary reptile, the *proteus anguinus*, an aquatic animal resembling a lizard, is found in this lake.

The Carpathian mountains branch off from the Julian Alps, bordering nearly the whole of the northern and eastern frontiers of Hungary, and protecting its vast plains from the chilly north winds, which sweep across the lowland of Europe, thus rendering its climate so mild, that the choicest productions of Southern Europe are there raised in perfection, and the richest wines produced. The most celebrated amongst the latter is that called Tokay, the sweet and luscious qualities of which plainly evince the warmth of the climate in which it is produced, this wine forming a strong contrast to the poor and sour wines of some parts of Northern Germany, where a less genial climate prevails. But although Hungary possesses these advantages, the whole country is not equally fertile, some parts being bare and rocky, others covered with swamps, and others occupied by barren hills of blown sand.

Wolves are common in the Carpathian mountains, and bears are occasionally seen. Some of the most formidable birds of prey belong to this part of Europe. The great cinereous vulture is principally found among these mountains. It measures three feet six inches in length. The golden or imperial eagle also inhabits these districts. A striking difference is observable in these birds of prey: the latter royal bird will devour no prey unless captured by itself, whilst the less noble vulture preys only on dead animals.

The mines of Hungary are of considerable importance. Gold and silver are obtained in greater abundance from the

mines of Schemnitz and Kremnitz, situated in a lower ridge of the Carpathians, than in any other part of Europe. This territory likewise yields iron, copper, lead, and mercury. There are also extensive deposits of coal and of salt. The fine stone, known as the true opal, is found near Kaschan, in Upper Hungary, and is by some authors supposed to be peculiar to this locality.

Returning to our central line, we next trace its prolongation in the Dalmatian range, called also (from Mount Dinara, the highest summit,) the Dinaric Alps. This range, which is situated between Hungary and the Adriatic Gulf, connects the Alpine system with the mountains of Turkey. The latter mountains, called the Balkan, extend from the Adriatic to the Black Sea. These mountains are very wild and rugged in their character, and the higher summits are covered with perpetual snow. The most elevated are Mount Argentero and Mount Orbelus. The Great Balkan range, in its eastern portion, where it is still known by its ancient Greek name of Hæmus, terminates abruptly on the shores of the Black Sea in a fine bold headland, called Emina Bournu, or Cape Eminah. Branches of great extent diverge from the southern side of the Balkan, the most westerly of which separates Roumelia from Albania, sending forth numerous spurs, or inferior branches into the latter province, and imparting a peculiarly wild and rugged character to its scenery. The most easterly branch from the Balkan, called the Strandshea range, gradually approaches the shores of the Black Sea, forming the high and rugged coasts of the Bay of Burgos, and terminating in the Sea of Marmora: this point also constitutes the European termination of our grand central line.

Extensive branches diverge from the Albanian range, and enter the territory of Greece :

Clime of the unforgotten brave !
Whose land, from plain to mountain cave,
Was freedom's home, or glory's grave !

The line of separation between modern Greece and Turkey is chiefly formed by the mountain crests of Chelona, Pindus, and Othrys. From the range in which these are situated,

various branches extend southwards, reaching to the borders of the *Ægean* Sea. Among these we meet with the classic names of *Helicon*, *Olympus*, and of *Parnassus*: the latter

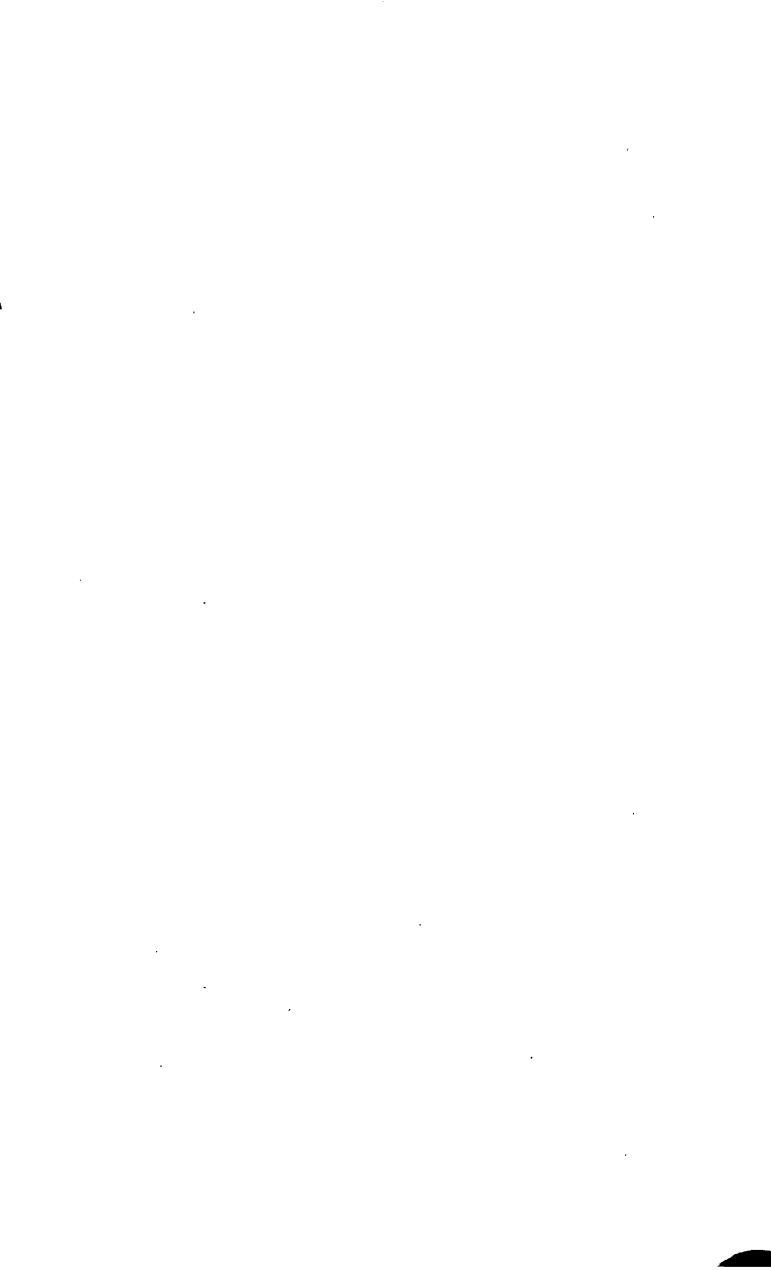
Soaring snow-clad through its native sky,
In the wild pomp of mountain majesty.

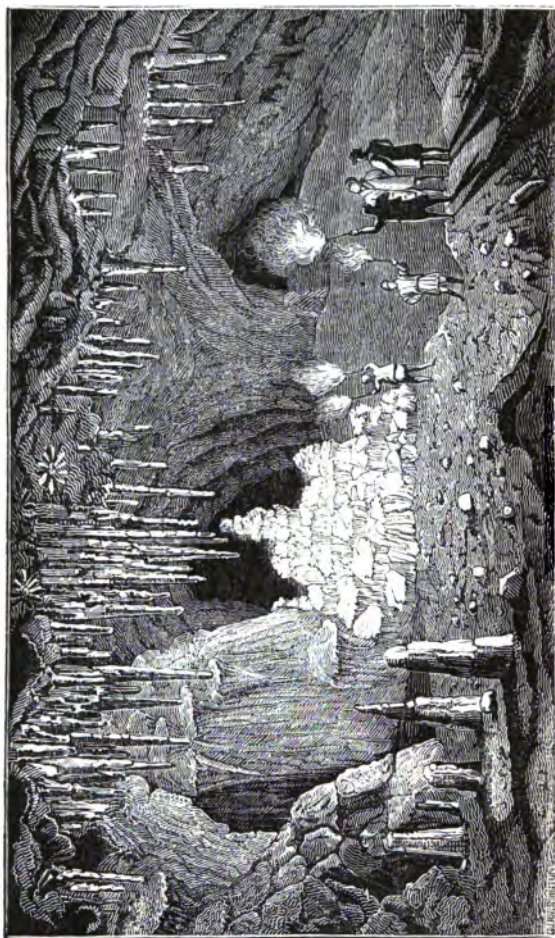
These mountain ranges enclose numerous basin-shaped valleys of remarkable fertility, frequently only accessible by narrow passes: this configuration of the country, having rendered it particularly adapted for the abode of several small independent states. Though changed the character of the inhabitants of this region, its natural productions are still the same as in its days of glory. The orange, citron, vine, olive, and myrtle, still flourish luxuriantly; the true laurel also, or sweet bay; whilst the “empurpled Mount *Hymettus*,” rich in aromatic herbs, is still celebrated for its scented honey. In the centre of the *Morea* rises the ancient *Arcadia*, consisting of an elevated table-land, containing in some parts beautiful valleys, but in others, presenting districts of a rugged and even somewhat gloomy character, seemingly according better with its present poverty-stricken and care-worn inhabitants, than with the happy sylvan beings with which the imagination delights to people the plains of *Arcadia*. The elevation of this table-land above the level of the sea causes it, however, to enjoy a delightful temperature during the summer months, when the plains at its base suffer from oppressive heat. Its mountains also attract and condense the vapour of the atmosphere, and this descends either in copious dews, or gentle and refreshing showers, and, sinking into the earth, gushes forth in numerous rivulets; and in the spring, its valleys are decked with the primrose and the deep blue violet, the banks of its streams adorned with the true poetical narcissus.

The islands of Greece are numerous, and generally partake of the beautifully varied and mountainous character of the contiguous mainland:—

. Who, O who, hath viewed,
Untouched with rapture, those sun-lighted seas,
Fancy's primæval cradle!

. Who hath looked
On those bright islands in the *Ægean* deep,
. . . Nor from each time-honoured shore,
Felt breezes redolent of glory blow!





Grotto of Antiparos.

The Cyclades, though bold and rocky in their character, are nevertheless covered with the richest verdure ; and, intersected as they are by the waters of the deep, they present scenery of the most varied and attractive description. They are celebrated for their highly valuable statuary marble, that of the island of Paros being esteemed the finest in the world. The small island of Antiparos is remarkable for containing some natural caverns of very singular character, the roofs, floors, and sides being entirely covered with incrustations of alabaster, this being the only known instance of a similar formation. This incrustation is of the most dazzling whiteness, and assumes various fantastic forms ; sometimes rising in splendid columns to the very roof, sometimes being suspended from thence in alabaster icicles, sometimes covering the surface with picturesque groups.

The island of Naxos, once celebrated for the worship of Bacchus, is still noted for producing good wine ; but at the present day it is perhaps most remarkable for its produce of emery, nearly all the emery of commerce being obtained from this island. The volcanic island of Santorina, and its accompanying cluster, are remarkable for the changes which have at various periods been effected in the whole group, by violent volcanic action.

The richly wooded island of Samothraki, or Samothracia, possesses an interest of totally different character, being mentioned in Sacred history as the spot at which St. Paul touched, in his way from Asia Minor to Philippi. This island rises abruptly from the sea, to the height of 5248 feet, being exceedingly beautiful, and covered with the most luxuriant verdure.

The island of Candia, the ancient Crete, is one of the largest islands in the Mediterranean, and is a spot highly favoured by nature. The interior is mountainous, and Mount Ida towers to a very considerable height ; but the coasts are occupied by plains and valleys of unusual fertility, covered with groves of myrtles, plane trees of splendid size, and various other beautiful timber trees.

The Ionian islands, though not of great elevation, are rugged, rocky, and picturesque. The nature of their surface renders

them ill-adapted for the growth of corn; but wine and fruits are produced in great abundance. That species, or variety of small grape, called the Corinthian,* is extensively grown in these islands, to which, and the Morea, the plant appears to be peculiar. The extensive and fertile, though at present ill-cultivated plains of Romania, or Roumelia, the ancient Thrace, occupy the space between the mountains of Pindus and the Balkan range. To the north of the latter mountains are situated the plains of Bulgaria, which in some parts are bleak and rugged, and in others are covered with swamps and marshes, though a large portion of the country exhibits considerable beauty and fertility.

Beyond the river Danube spread the vast plains of Wallachia and Moldavia, which may be regarded as forming part of the great lowland of Europe. These plains are flat and marshy in the districts bordering on the Danube, but as they recede from that river, (and more especially in their western parts, where they extend to the base of the Carpathian mountains,) the country becomes diversified and picturesque. The almost innumerable stagnant pools that occur in these plains render them unhealthy. This territory, in its more level parts, experiences an excessive climate; the summers being exceedingly hot, and the winters of such severity, that the Danube is usually at that season so completely and firmly frozen over for six weeks, as to bear the heaviest carriages. And yet these plains are in the same latitude as the south of France, and in a warmer one than the most favoured districts of Hungary; to the latter of which, especially, they present a remarkable contrast, affording a striking illustration of the effect produced on climate by local variations of the surface: for the flat plains of Wallachia and Moldavia have only a trifling elevation above the sea-level, and therefore experience greater summer heat; but, being unprotected by any mountain range, or elevated land, from the chilling northern blasts which sweep across the low territories of Russia, their winters are thus severe. Hungary, on the contrary, as has been already observed, slopes gently towards the south, and is

* Corrupted into *currants*, and largely imported into this country in a dried state.

protected on the north and east by the Carpathian mountains.

The vegetation of Greece and Turkey, including the Grecian Archipelago, presents some features of more than usual interest. Diversified as is the surface of these territories, we shall be prepared to expect a varied vegetation; but this is by no means all; we here meet with instances of the marked natural division in the floras of certain regions. In the countries over which we have passed, our attention has already been called to the influence of latitude, of elevation above the sea, and other causes, on the natural limits of plants. It also appears, that certain plants have easterly or westerly geographical limits, both as to their distribution, and the nature of their produce; subordinate, however, to the isothermal lines, by which the zones of vegetation are mostly determined. These limits, which, perhaps, may not inappropriately be termed *meridional limits*, or *longitudinal limits*, are, in some cases, clearly dependent on the natural geography of the regions in which they may be traced; in others, however, the cause of their occurrence is less evident. More than one instance of these meridional limits, will be afforded by the region now under our consideration.

Greece forms the most westerly limit of various plants, well known in our groves and gardens as cultivated species, but which have never been found growing wild to the westward of the Adriatic, though they are indigenous in Greece, as also in Asia Minor, and other eastern regions. Among these are the horse-chesnut, weeping willow, almond,* common or cherry laurel, pomegranate, &c. &c. In this case, the meridional limit has evidently been dependent on the natural geography of these regions; these plants having been checked in their westward progress by the expanse of sea, including the Mediterranean and the Adriatic, which latter extends into too high a latitude to admit of their passing its northern shores.

Less evident, however, is the cause of another meridional limit, which also occurs in this region. In the Grecian Archipelago we first meet with

Groves whose rich trees weep odorous gums and balm.

* This limit of the almond does not, however, apply to Africa, that tree having been found growing wild in Barbary.

It is not, however, that the same species do not occur in more westerly regions, but that they are not "rich" in these "odorous gums" in those parts. Thus, we have already met with the *pistacia lentiscus* and *pistacia terebinthus*, in Spain and Italy: these trees, however, in those regions, produce no supply of gum resin; but in the Grecian islands, and more especially in Scio, this substance exudes from them in great abundance. From the former (*pistacia lentiscus*) flows gum mastich, this being generally obtained by making incisions in the bark; whilst, from the *pistachia terebinthus*, or terebinth tree, gum terebinth flows naturally in a more liquid state. It is not easy, however, to assign a cause for this limit of the produce of these fragrant gums; the island of Scio is not in a more southerly latitude than the other countries in which we have met with these trees; and it would almost appear that these islands, bordering as they do upon Asia, partook of the luxuriance of its vegetation, and formed the western limit of the rich products of Eastern climes. The gums we have mentioned are by no means the only species which occur; gum tragacanth is the product of several plants of the *astragalus* kind, and gum ladanum of the gum *cistus*, and other species of *cistus*; and both these are particularly abundant in Crete. All these odoriferous gums are much used by the Turks for incense or perfumes; and it is a universal practice throughout the Ottoman empire for the women to chew gum mastich. These odoriferous trees are indeed so common in some of the Grecian islands, that they form the ordinary fuel of the inhabitants, nothing being used for that purpose, except the mastich tree, cedar, *cistus*, lavender, and other fragrant woods: so that, "not only is the air scented with the balsamic odour of the numerous aromatic plants, but the very smoke is perfumed with the fragrance of the wood of which their fires are made."

These islands again, and the neighbouring shores of Asia Minor, are remarkable as being the original habitation and western limit, of some of our well-known but much-esteemed garden flowers; the tuberose, hyacinth, tulip, narcissus, ranunculus, anemone, &c., all being natives of this region. The ranunculus more especially abounds in Crete; the anemone

in nearly all the islands of the Archipelago, which, in the spring, appear like a rich carpet, being studded with anemones of all colours. These flowers, in their natural state, are usually single, and may in some instances have been improved by cultivation; but their hues are not less brilliant than with us.

The vegetation of the mainland of Greece and Turkey presents, in the lowlands of its more southern districts, most of the plants we have observed in similar situations in Spain and Italy. Date trees are, however, rare; the only trees of this description known to exist in continental Greece, being a few in the vicinity of Athens: though this is not attributable to the climate; for the prickly fig, which is equally tender, grows abundantly, forming strong defensive hedges. The orange and lemon are produced abundantly in the Peloponnesus, growing on the eastern coast, in Bœotia and Thessaly, nearly as far north as the range of Mount Olympus, not, however, coming to full perfection in the lovely Vale of Tempe, situated to the south of that mountain. But in the western districts, sheltered as these are from the north-east by the Albanian mountains, the range of these plants extends to the Gulf of Quarnaro; whilst the olive, fig, myrtle, mulberry, manna ash, stone pine (fig. 145), pinaster, terebinth tree, and their usual accompaniments, skirt the shores as far as the extremity of the Adriatic. It is only, however, near the coast, that these plants of warmer zones are met with; at a short distance inland they altogether cease, and are succeeded by the chesnut, ash, lime, horse chesnut, mountain ash, service tree, wild apple and pear trees, oak, &c. The latter, crowned with the true ancient misletoe, still flourishes in the highlands of Arcadia, where, under the Greek mythology, every oak had its dryad. The mountainous regions are covered with forests of beech, pine, or Scotch fir, &c.

The native animals of Greece and Turkey are little known. The most remarkable are, perhaps, the Cretan sheep and the musmon sheep, both of which appear to be natives of the island of Crete. The Cretan sheep is noted for the singularity of its horns, which, first turning outwards, form a complete circle, then taking a vertical direction, ascend in a spiral

form. The wild musmon sheep, which is said to be still found in the mountains of Crete, is supposed to be identical in species with the numerous races of sheep now spread over Europe. The Albanian dog has been celebrated from remote antiquity, and is a very beautiful animal, with long silky hair. The Turkish greyhound, on the other hand, though well-formed, is an ugly little animal, the skin being almost destitute of hair.

Among the known birds, the most interesting are the pink-coloured flamingo, the pelican, and the stork; which latter is said to build unmolested in the ruins of the ancient temples.

The silk-worm was introduced into Greece by Justinian, in the sixth century; and shortly afterwards the *mora*, or mulberry tree, became so abundant in the Peloponnesus, that the name of the latter was changed to the Morea.

CHAPTER XIII.

EUROPEAN LOWLAND. — BELGIUM. — HOLLAND. — DENMARK. — LOWER GERMANY. — POLAND. — RUSSIA. — NORTHERN HIGHLAND OF EUROPE. — SCANDINAVIA.

Sweep by Holland like the blast:
One quick glance at Denmark cast,
Sweden, Russia,—all is past. MONTGOMERY.

HAVING now traced our grand central line, and its subordinate branches, across the whole of Europe, it will be desirable, ere we follow the course of this mighty mountain range through Asia, to take a glance at some important portions of Europe, which we have still left unexplored, namely, the Great Lowland, and the Northern Highland.

The Great Lowland, as has been already remarked, includes the Netherlands, Denmark, the northern districts of France

and Germany, nearly the whole of Poland, and the greater part of Russia.

We have already taken some notice of that part of France which is included in the Great Lowland; Belgium and Holland form a continuation of this extensive plain. Spurs or minor branches, from the Rhenish Mountains, extend into the south-eastern districts of Belgium, giving a hilly character to that region; but it is in general flat and undiversified; though not in so remarkable a degree as Holland, which forms the lowest portion of the Great Lowland, being in many parts nearly on a level with the ocean. Owing to the trifling elevation of this country above the sea, it was exposed to the risk of inundation at every high tide; but the mighty work of constructing barriers and dykes has been effected, and the land rescued from the overwhelming waters. In olden time, too, a large proportion of this region consisted of harsh barren sands, producing nothing but heath and fir. The whole territory has, however, been cultivated like a garden, and brought to a state of the greatest fertility; thus in every way affording a striking example of the triumph of human industry over natural difficulties, but presenting little to arrest our present attention.

Holland does not contain any valuable mineral deposits, and the fuel used is chiefly turf or peat. In the southern districts of Belgium a vast coal field occurs, forming a portion of the largest coal district known to exist in Europe. It is stated that there are three hundred and fifty mines in Belgium alone. Mines of iron ore also occur, and the mineral called black chalk.

The kingdom of Denmark forms another portion of the Great Lowland: this country presents a nearly flat surface, and the soil is generally sandy; but owing to its insular situation, and the consequent humidity of its climate, many of these level sandy tracts are converted into marshes. From the same cause it is not subject to severe frosts, but its summers are chilly and moist; so much so, indeed, that wheat will not ripen, though rye, barley, and oats are extensively cultivated.

The northern parts of Germany consist of one vast plain,

in some parts so low, that dykes are required to protect it from the encroachments of the ocean. Probably no country of equal extent occurs in Europe, possessing a less fertile soil than this plain; and were these tracts deprived of the abundant supplies of rain and snow which annually descend upon the surface, there can be little doubt that they would soon be as arid as the sandy deserts of Africa. The winds which sweep across these plains produce, as we have already noticed, (according to their chilling moisture in the spring, or to their autumnal aridity,) much effect on the temperature of our eastern counties. The whole country in this part is nearly destitute of trees, and presents little besides these sandy wastes and peat bogs, alternating with tracts covered with heath and juniper; with the exception, however, of the banks of the rivers, and of a fertile tract occurring near the centre of the plain, which acquires its different climate from being enclosed between some hills, branching off from the Great Southern Highland, and which extend into this part of Germany. The river Elbe crosses this plain, and to the eastward of that river the general fertility is greater, the sandy tracts, in lieu of being destitute of vegetation, being covered with vast forests of pine. The whole of the coast bordering on the Baltic is, however, flat and sandy; but the larger rivers, especially the Vistula and the Niemen, form deltas of alluvial soil at their mouths, and these spots are exceedingly fertile.

A ridge of more elevated land crosses the northern part of the Germanic plain, extending from Holstein to Dantzic, and taking a general direction from east to west, the course of which may be traced by the *water-shed*, or course of the small rivers which take their rise in this ridge, on the one side falling into the Baltic, and on the other, uniting their streams with the Elbe, the Oder, and the Vistula. On the northern side of this ridge, and even in some parts to the southward of it, vast numbers of erratic blocks, or boulders, are found, composed of the same description of rock which forms the mountains of Scandinavia, from whence these boulders are supposed to have been transported at some ancient though unknown period.

Poland may be considered as a continuation of the plains of Germany, and forms another portion of the Great European Lowland, with the exception, however, of the provinces of Lodomeria, and Galicia, which are more elevated, and of diversified character; and being thus greatly improved in climate, they are generally exceedingly fertile, and in some parts covered with dense forests. The flat districts of Poland are chiefly occupied by deep layers of sand, alternating with damp clayey tracts. These plains being open to the north, the winters are exceedingly severe, and the country is subject to violent winds, blowing almost uninterruptedly across that wide level expanse.

Allusion has already been made to the mineral deposits of Upper Germany: the flat districts of which we have now been speaking, do not contribute much to the mineral wealth of Europe. The same remark applies to the level districts of Poland; though in that territory, lignite, or brown coal, is found, and amber occurs in the same deposit. In the more elevated southern territory of Galicia, (though this perhaps belongs rather to the Southern Highland of Europe,) beds of bituminous coal resembling that of Britain, are met with, and extensive deposits of salt; the whole substratum in this district being more or less impregnated with the latter mineral. The principal salt works are those of Bochma and Wieliczca; the former of which is celebrated for the superiority of the salt produced, the latter for the vastness of the works, which are perhaps the most extensive in the world; the excavations in the mine of Wieliczca being described as extending seven or eight miles in length, nearly a mile and a half in breadth, and as penetrating to the depth of from three to four thousand feet. The passages and caverns cut out of the solid salt present a sparkling and beautiful appearance; and, to add to this general effect, some elegant little chapels or oratories, adorned with figures of saints, have been cut out of the mineral. The stables for the horses employed in the works are also cut out of the solid rock salt.

The vegetation of the Netherlands, of the German Lowland, and of Poland, exhibits, generally speaking, much resemblance to that of Great Britain, and of Northern France:

the coast districts, which possess an insular climate, approaching in character to that of our island; and the inland districts, which from their continental situation experience a more excessive climate, resembling that of Northern France. The majestic Rhine,—on whose banks we behold

A blending of all beauties; streams and dells,
Fruit, foliage, crag, wood, corn-field, mountain, vine,—

flows through the western part of this Lowland. In this beautiful district, wine is produced as far north as latitude 51°. But this wine, well known as hock, or hock-heimer, though equally, and to many tastes more agreeable than the rich and luscious wines of some parts of Southern Europe, exhibits, by its deficiency in body and sweetness, the effect produced by climate on the fruit of the vine: and this is yet more strikingly displayed in the poor and hard wines which are made on the banks of the Elbe and Oder, a considerable portion of which, indeed, is used only for vinegar. All the grains capable of being cultivated with us, are advantageously grown in Germany, though rye forms the staple food of the great body of the people. The forests of Germany are very noble, and include most of our well-known timber trees. Cherries and other wild fruits are met with in great abundance in these woods, and form a considerable resource to the poor as an article of food. The wild boar (fig. 74) still inhabits the forests of Germany.

In European Russia, the Great Lowland expands to the breadth of twelve hundred miles, presenting the largest extent of level surface in Europe, being only interrupted, as before mentioned, by the Valdai Hills, and chiefly consisting of immense levels, denominated *steppes*, terminating only at the base of the Oural or Uralian mountains, which form the boundary line between Europe and Asia, and which separate these vast plains from the no less extensive steppes of Northern Asia. In the southern districts, however, and especially in the Crimea, we meet with some steep and picturesque, though not elevated, ranges of hills.

Few mineral deposits of importance have hitherto been discovered in European Russia. Good coal has, indeed, been found in some districts, but the mines of that invaluable mate-

rial do not appear to be considerable. Some iron mines also occur; and copper is found near the base of the Uralian mountains, a large tract of country being covered with a peculiar formation, which, from its containing a large proportion of that metal, is called copper sand. Gold has also been found in the same locality, though not in such great abundance as on the eastern flanks of these mountains. A very extensive deposit of salt occurs in Russia. Erratic blocks are very numerous in the plains which extend from St. Petersburg to the rivers Dwina and Niemen: they are formed of granite, resembling that of the mountains of Wiborg in Finland.

Level as is the surface of this vast territory, it will afford no striking instances of the variation of vegetation at different elevations; but, extending as it does through about twenty-six degrees of latitude, it exhibits a great diversity in its vegetable productions; and these bear a general resemblance to those of the countries we have already explored, though they present some peculiarities which it will be interesting to consider.

The climate of the Crimea approaches to that of Greece and Italy, and a considerable similarity exists between its vegetable productions and those of the latter regions. The vine is indigenous in the Crimea, abounding on the hills, there being two species, one of which produces small round black grapes, and the other oblong grapes of a greenish white colour. With these vines grow red and white roses, the sweet clematis vitalba, or virgin's bower, jasmine, &c.; whilst in the spring, the hills and eminences are diversified and enriched with the brilliant hues of the various flowers with which the earth is adorned; sometimes one species, sometimes another prevailing, according to the nature of the soil, or aspect of the hills, which form the natural abode of the different species; whilst the air is perfumed with the odour of their blossoms, to which the violets, which are exceedingly abundant, do not slightly contribute. Among the wild fruit trees of this district, are cherries, and early and late apples and pears; the sloe grows in the greatest luxuriance, but wild plums are not common; nor do peaches and apricots succeed when cultivated. Among the forest trees we meet with oaks of splendid dimensions, as well as the linden or lime tree (fig. 40), beech (fig. 79), elm

(fig. 100), poplar, maple, ash, &c. Among the shrubs we find the lantana, or way-faring tree (the wood of which is used to form tubes of tobacco pipes, in great request in Russia and Germany); the pyracantha, caper bush, &c. Maize and millet, as well as wheat and barley, are cultivated; cucumbers also, of large size; and gourds of various sorts. Hemp (fig. 89) is much grown, and the flax (fig. 33) grown in this part, is greatly esteemed on account of the fineness of its fibre.

The level plains of Southern Russia, which are watered by the great and broad rivers of the Dnieper, the Dniester, and the Don, are chiefly covered with luxuriant pastures, though, where they have been brought into cultivation, they have produced remarkably abundant crops of the finest wheat. Extensive forests, consisting of oak, elm, mountain ash, or rowan, &c., also abound in some of the central districts; but those parts distinguished by the name of the East Sea provinces, consist of a flat, dreary country, buried in snow during half the year, and occupied by forests of birch and pine. In this district, in place of maize and wheat, we find the hardier kinds of grain cultivated, and these succeed only in the most favourable spots. In the whole of Northern Russia, the oak is unknown, but the arctic provinces are overspread with vast forests of pine and fir; the pine, or Scotch fir, being particularly abundant. It is remarkable, that the greater the intensity of cold (within certain limits), the firmer and more compact does the timber of the latter tree become. The value of trees which do not lose their leaves in winter, and consequently afford shelter, not only to animals, but to man, during that inclement season, is much more sensibly felt in these wintry regions, than in temperate zones. Beyond a certain point, however, these trees become stunted, and at length, as we approach the shores of the Northern Ocean, they totally disappear. The birch trees, which have accompanied them in their northward progress, extend beyond the coniferous or cone-bearing trees; extensive forests of birch (fig. 83) occurring in the more northern districts. These, in their turn, however, become stunted, and we find a large surface occupied by the arctic bramble (fig. 55), whilst the dwarf willow (fig. 108) extends almost to the utmost limits of vegetation.

The Russians turn to economical purposes many vegetable productions, considered of little account among us. Thus, of the bark of the birch tree they make cordage, fishing-nets, and even sails for the boats used on the lakes; a kind of oil is also extracted from this tree, called *diojet*, which is used in the process of preparing Russia leather, to which it imparts its peculiar odour and colour. The lime or linden tree is also a valuable tree in Russia, ropes being made from the inner bark; and the garden mats, so extensively employed in our country, and called bass matting, are all imported from Russia, and formed of the same material.

The long continuance of winter in Northern Russia, and the consequent failure of supplies of fresh vegetables, leads to the extensive use of preserved berries of various sorts, as substitutes for these important accompaniments to animal food. Thus, the berries of the mountain ash, or rowan tree, which with us are only valued from their ornamental appearance, or from affording food to the feathered tribes, are in Russia collected in vast quantities, and, with cranberries and various other wild berries, salted for a winter store. This tree appears to attain a magnificent size in the northern parts of the empire, and

Decked with autumnal berries that outshine
Spring's richest blossoms, yields a splendid show
Amid the leafy woods.

The juniper also grows to a remarkable size in Russia; and cranberries and bilberries are exceedingly abundant. We thus find that, though the climate is unsuited for the produce of more temperate lands, it is peculiarly adapted for the growth of its appropriate vegetable productions; and some of these berries form a constant addition to the meal of the peasant. Potatoes have been introduced, and are capable of being cultivated as far north as Archangel, to which place the culture of hemp and flax also extends.

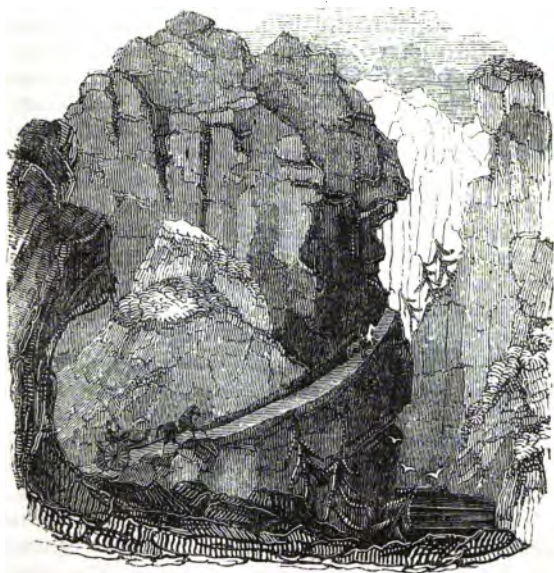
The wild quadrupeds of this extensive territory are numerous. Among these, the most remarkable is the urus, or zubr (fig. 95), which anciently inhabited the whole tract between the Baltic and the Balkan mountains, and probably extended across the whole of Western Europe, even to Britain, but

which is now confined to a single habitation, the wild and swampy forest of Bialowieza, in Lithuania. Wolves, bears (fig. 30), and the other European animals, also abound in the forests of the Central districts. The most remarkable animals of smaller size, are the bobac, or Poland marmot, and the Alpine, or calling hare. These little creatures, and especially the latter, exhibit a striking instance of the instinct with which certain animals are endued, and by which they are adapted to the natural habitations assigned them. The Alpine hare, or pika, inhabits the thickest and most sequestered forests in the more elevated and cold regions of Northern Europe. It feeds only on vegetable substances, and of these, in the region it inhabits, there is necessarily a complete failure for many months in the year; but, guided by instinct, the Alpine hare amasses an ample store of provisions against the winter. About August, these animals cut and collect large parcels of grass, which they spread and dry, and, in effect, convert into hay: this they collect into stacks, about seven feet high; they then excavate a subterranean passage, which opens under their stack; and by this, they obtain access to it from their burrow; the whole being, during the winter, entirely enveloped in a deep covering of snow.

The *Northern Highland* of Europe comprises the whole of Scandinavia, including Sweden, Norway, and Lapland. The mountain system of this region is wholly independent of the grand central line, and the elevated districts of North Britain are considered as detached portions of this range. This mountain system, known as the Dofrines, or Dofrafeld range, traverses the whole of the western side of Scandinavia from north to south, extending for nearly a thousand miles. It exhibits many bold and lofty summits, covered with perpetual snow; the most elevated of which is Sneehatta, rather more than eight thousand feet above the level of the sea. The mountains of Olonetz, in Finland, may be considered as belonging to this mountain system.

The Dofrafeld Mountains send forth spurs, or minor branches, into Norway, the whole of which country is situated between these mountains and the sea, and consists of a

narrow region, in some parts not exceeding 150 miles in width, rugged in the extreme, though intersected by numerous valleys; among which, the most extensive and beautiful, as well as most celebrated in Norwegian tales, is the valley of the Guldal, in the province of Drontheim, said to have been the abode of the mighty Haco, and of the wise Olaf. These valleys are frequently difficult of access, and the scenery in the Norwegian mountain passes is of a bold and picturesque character.



Pass between Scøgstadt and Vaug.

Fiords, or inlets of the sea (resembling the Scottish lochs), intersect the shores of this region in all parts, winding their way among the lofty and threatening rocks. This district, steep and rugged as it is, partakes of the milder climate belonging to the western side of the Old Continent; and it will be remembered, that Drontheim forms the most northerly

limit in the world, of the successful cultivation of wheat. These fiords, also, where not exposed to the full force of the vast ocean which dashes against their shores, are clothed to the water's edge with forests of pine, fir, and juniper; behind these woods rise magnificent hills upon hills, until the latter terminate in the snow-capped summits of the Dofrafeld; the whole presenting a scene of the most striking and picturesque description.

Lateral branches extend from the Dofrafeld range into Sweden; but the centre of that country is occupied by an immense plain, intersected by numerous picturesque lakes, and covered with vast forests. The southern portion of Scandinavia, called Gothland, or Gotaland, consists of a large peninsula, and from its sheltered and insular situation, it enjoys a milder climate than any other part of Scandinavia. The more northern districts, known by the name of Norrland, possess a very cold climate, arising not only from the higher latitude, but also from the elevation of the land above the sea. The snow line, in this part, descends to the limit of 3000 feet above the sea; and not only are the mountains perpetually capped with snow, but large elevated table-lands occur, which never lose their icy covering. Even in the more favoured districts of Norrland, the trees become stunted, and the most hardy species of grain alone are capable of cultivation in a few sheltered spots; the potato has, however, of late years, been introduced, and cultivated with advantage.

Lapland is situated almost entirely within the Arctic circle, and consequently experiences a very severe climate, not, however, by any means so intense as that suffered by regions in the same parallel of latitude, in North America. The surface of Lapland is much varied; extensive level tracts occurring in some parts, whilst others are covered with mountain ranges, the most elevated summits of which are about 4000 feet above the sea-level. The coast presents a continuation of the same bold and rocky features which characterize the shores of Norway. Numerous islands lie off this coast; in the island of Qualoe is situated Hammerfest, the most northerly town in the world; and on the island of Mageroe, yet further north, stands the little village of Kelvig, where

four or five families reside. This island rises almost perpendicularly from the sea, and at its remotest point is the North Cape, forming the extreme northern boundary of Continental Europe. This cape consists of an enormous mass of bare rock, presenting its bold face to the winds and waves of the Arctic Ocean; not, however, altogether unscathed, for large portions of the rock are continually undermined and thrown down, and the island thus becomes gradually reduced in size.

Finland, in its natural features, greatly resembles Sweden, consisting of a succession of hill and dale, abounding in forests of fir and birch, and interspersed with numerous lakes; the surface of the country is overspread with shattered fragments of granite. The winters are more severe than in Sweden, and at that season of the year, Finland is covered with a hard uniform surface of ice and snow, in which the roads are indicated by boughs of fir; and the Gulf of Bothnia is so completely frozen over, that sledges cross from Finland to Sweden.

The mines of Scandinavia are peculiarly rich in important products. Coal-mines have long been worked in Sweden; and iron is very extensively diffused both in Sweden and Norway. The iron obtained from the mine of Danemora, in Sweden, is considered as the finest in the world, and is used for cast steel in our manufactories at Sheffield. Lead mines of some importance are met with in various parts of Sweden; and a most extensive deposit of copper occurs in the province of Dalecarlia. The silver mines of Konsberg, in Norway, are the richest in Europe: the silver mine of Sahla, during the reign of Queen Christina, yielded annually 20,000 marks of silver, but at present this mine does not afford above 2000 or 3000. The mine of Adelfors, in Gothland, is celebrated for its produce of gold. The working of this mine began in 1738, and for some years it yielded thirty or forty marks of gold annually, but now it only furnishes three or four. The porphyry quarries of Elfdal are the largest and most celebrated in Europe, the greater part of the fine modern works formed of that material being executed in the porphyry of Elfdal.

The vegetation of the more southern districts of Scandinavia, much resembles that of the northern and mountainous

districts of Great Britain; the peninsula of Gothland being almost the only district where wheat can be cultivated with advantage; and in the latter district extensive barren tracts of blown sand have, within a recent period, by careful and judicious cultivation, been consolidated, and covered with plantations of corn and timber. In the other parts of Scandinavia, only the hardier species of grain—rye, oats, and barley—are capable of cultivation, and these only in situations favourable to their growth. The most northerly cultivation of barley, however, occurs in this region, which comes to perfection in some sheltered spots in Western Lapland, nearly as far north as latitude 70° . The peasantry used formerly to grind the bark of the fir-tree to make bread; and even, in times of scarcity, occasionally to add to this the remarkable mineral substance called *berg-mehl*, or mountain meal. The potato has, however, within late years been introduced into this region, and cultivated with considerable success, to the utmost limits of the growth of barley; and agriculture in general has been greatly attended to.

Vast forests occupy a large portion of Scandinavia, consisting chiefly of the birch, the Norway spruce fir (fig. 149), and the pine or Scotch fir (fig. 141). The poplar, alder (fig. 87), and willow, are also indigenous. The superiority of the Norway timber renders it an object of considerable importance as an article of commerce; and thus, although the nature of the climate may deprive the inhabitants of this territory of some important vegetable productions, it appears to render others more valuable; and hence, by a mutual interchange of productions, different nations may be benefited. The Norway spruce fir is particularly valuable for masts of ships; it also yields abundance of tar, pitch, and turpentine, the Burgundy pitch of commerce being the produce of this tree. Its form is very regular, and it is distinguished by its pendant cones.

In the colder and more elevated districts, the spruce-fir appears as a slender pole, covered from the ground with short drooping branches; whilst the Scotch fir, on the contrary, has a short stunted stem, with widely-extended branches. Generally speaking, the trees in the Scandinavian forests do



Norway Spruce Fir.—*Abies Excelsa*.

not attain any great height, and in the more northerly parts become very low and stunted. Beyond the region of the spruce and Scotch fir, the dwarfish forests consist only of birch, intermingled with a few aspens and mountain ash trees, which, however, do not ripen their fruit; but some juniper-bushes still occur. At 800 feet below the snow-line, the birch is no longer erect, but creeps upon the ground; though some plants of the willow kind still attain the height of two feet. The only berries which ripen in this situation are those of the crowberry; but it is not a little remarkable, that these are twice as large as those which grow in regions more favoured by nature, and at the same time better flavoured. The andromeda, the campanula, and the azure gentiana, still adorn these ungenial territories; these cease at 200 feet below the snow-line, whilst some saxifrages and a few other plants extend to that limit. Nor is vegetation wholly suspended beyond the line of perpetual congelation; for on some of the mountains bordering on the Northern Ocean in the remotest parts of Finland, a partial thaw appears to take place under the covering of snow, creating a moist and in some places even a boggy soil; in such situations, at the elevation of 500 feet beyond the snow-line, the *ranunculus glacialis* is still met with, and also the little dwarf willow, whose diminutive size, scarcely above a foot in height, might have induced us to regard it as an herbaceous plant.

Scandinavia abounds in cryptogamic plants, both of the fungus and the lichen kind; among which is the cudbear (fig. 216), used in dyeing, large quantities of this lichen being collected and exported for that purpose. And, destitute as the more northerly districts of this region appear of useful vegetables, the bountiful Author of Nature has not left them unprovided with productions, suited to the sustenance of the creatures whose natural habitations are fixed in these high latitudes. A remarkable instance of this is afforded by that species of lichen, called rein-deer moss (fig. 218), a plant which, in other climes, where rich pastures abound, might be regarded as of little value, but which constitutes the chief support of the rein-deer, and thus, in fact, remotely, though not directly, of the human inhabitants of those regions, for

without that highly useful animal the Laplanders could not subsist. "Thus, things which are deemed the most insignificant and contemptible by ignorant men, are, by the good providence of God, made the means of the greatest blessings to his creatures."* This lichen grows so luxuriantly in this cold climate, that it is sometimes met with a foot in height: its utmost limit is about 800 feet below the snow-line.

The native quadrupeds of Scandinavia present us with some of those species, whose range extends over the northern parts of both the Old and the New World. Among these are the glutton, considered identical with the wolverine of America, and the elk. In Scandinavia, the range of the latter animal is between latitude 53° and 65° . Scandinavia also ranks among her native quadrupeds, the lynx, beaver, lemming (fig. 54), flying squirrel, stag, fallow deer, &c.; and the Laplander's treasure, the rein-deer, (fig. 87). The rich, are said sometimes to possess herds of from 1000 to 2000 of these useful animals, —the poor, seldom less than 100. During life, the rein-deer supplies its owner with labour and with milk; and after death every part of the animal becomes serviceable. Cows and sheep have been introduced into these regions, but such is the effect of climate on those animals, that in Finland, the cows are said not to exceed a bull-dog in dimensions, and sheep to be about the size of a large cat.

The birds include the golden eagle (fig. 113,) and the greater number of species which inhabit northern Europe; but among those peculiar to these cold regions, are the mocking-jay, the nut-cracker, the great snowy owl, and the gigantic Lapland owl, the latter being confined to the dreary solitudes of Lapland. Both these owls prey upon the various species of grouse and ptarmigan, which are so numerous in these northern latitudes, and among which is the cock-of-the-rock, the largest known species of grouse.

Among the insect tribes, the most remarkable are perhaps the gnats, which swarm in myriads, especially in the Lowlands; these annoying little creatures being far more numerous for a short season in these high northern latitudes,

* Linnæus; quoted in *Encyclopædia of Geography*.

than they are in the swampy woods of tropical America; in some parts rendering the country almost uninhabitable.

A geological phenomenon of great interest is afforded by this portion of Europe. The whole country from Fredericks-hall, in Sweden, to Abo in Finland, and perhaps as far as St. Petersburg, appears to be gradually and insensibly rising; the rate of elevation being estimated at about three feet in a century. It was long supposed that, instead of a progressive rise taking place in the dry land, the waters of the Baltic were gradually diminishing; but careful investigations have demonstrated, that this change of relative level does not take place in all the shores of that sea, none occurring to the south of Scania, or Schonen. The causes which are effecting this extraordinary, though peaceful revolution, are concealed from our knowledge; and it is not a little remarkable, that scarcely any region has been more free from earthquakes within the historical period, than Scandinavia. We have already mentioned that the volcanic bands, both in the Old and New World, extend in the direction of the mighty mountain ranges which traverse each of those vast continents; and it is a subject well deserving our attention, that this northern highland of Europe, which is detached from the grand central line, and remote from the volcanic band, should thus present the phenomenon of an elevatory movement of different character, which appears to be raising it above the low plains of Northern Germany.

The Faroe Islands are rugged and mountainous; and from the nature of their damp and chilly climate, barley is the only grain that will come to perfection. They are, however, covered with pasture, and the inhabitants depend for subsistence, in great measure, on their sheep, and on the numerous birds which frequent the rocky shores of these islands.

Iceland may be considered as one of the most extraordinary territories in Europe, as it is situated on the very borders of the arctic circle, and covered with mountains ranging from 3000 to 6000 feet in height, and consequently, in this high latitude, capped with perpetual snow; whilst almost every part of the island exhibits indications of energetic subterranean heat, which is openly developed in many parts in the pheno-

mena of volcanos, caldrons of boiling mud, and boiling fountains. Hecla, though the most noted mountain, or yokul (as they are locally termed), is by no means the loftiest summit,—the yokul or jokul of Oefere rising to the height of 6240 feet above the sea.

No trees grow upon this island: but the occurrence of *sur-turbrand*, and other kinds of fossilized wood, appears to indicate that, at some remote period, forests may have occupied its soil. At present, however, the inhabitants are dependent for their supply of timber on the drift wood cast upon the coast. Nor is this insignificant in amount; for by a provision no less remarkable than admirable, the currents of the ocean, which set in upon this island, deposit upon its shores vast stores of uprooted trees, borne thither from some more genial clime. The pastures in some parts of Iceland are very good, but in others so scanty, that the poor people may be seen on their knees, scooping out with a clasp knife, the few blades of grass which spring up between the interstices of the rocks, as fodder for their cattle. The only grain capable of cultivation is barley, and that merely in a few favoured spots. The species of lichen called Iceland moss (fig. 217) occurs abundantly. Among the animal inhabitants of this island, the eider duck (fig. 136) is one of the most important.

Situated wholly within the arctic circle, rises the dreary territory of Nova Zembla, or Novaia Simlia. The land on the western side is mountainous, and some of the summits reach the elevation of 3500 or 3800 feet above the level of the sea; but the shores on the eastern side are described as generally low, and presenting a desolate and monotonous appearance. Though generally little penetrated with inlets or sounds, one, which runs east and west, reaches entirely across, dividing the territory into two nearly equal parts.

We have before mentioned that Nova Zembla is considered as forming part of a barrier, which arrests in their westward course the masses of ice borne down by the great Siberian rivers, and which is, to a great degree, instrumental in moderating the climate of Western Europe. It will, however, be readily conceived that, useful as this mass of land may be in this respect to other territories, its own temperature will

suffer from these chilling influences. And accordingly, we find the natural productions of Nova Zembla bearing testimony to the ungenial nature of its climate, this territory being described as even more dreary than Spitzbergen, though the latter is considerably further north. Surrounded as it is by the waters of the Arctic Ocean, Nova Zembla, however, possesses an insular climate, neither suffering such intense cold as some approximate continental regions, nor, on the other hand, enjoying so much compensating summer warmth; circumstances, the latter especially, which greatly influence and abridge the number of its natural productions.

Although by no means absolutely destitute of either animal or vegetable life, Nova Zembla displays, in a striking degree, all the characteristics of an arctic region; and this scene has been so forcibly depicted in the recent remarks of M. Von Baer, that we cannot do better than avail ourselves of his description.

"The total want, not only of trees, but also of every kind of shrub large enough to attract the eye, gives to polar landscapes a peculiar and deeply-impressive character. In the first place all power of measurement is lost to the eye. From the want of the usual objects of known dimensions—trees and buildings—distances appear much less than they are. Nor does this deception seem to depend solely on the absence of familiar objects, but also on a peculiar transparency of the atmosphere; so that the mountains apparently approach quite near, and are consequently at first considered to be much lower than they actually are.

"Another effect of the want of trees, and even of a vigorous growth of grass," continues M. von Baer, "is the sensation of loneliness, which seizes not only upon persons of reflection, but even on the roughest sailor. It is by no means a sensation of fear, but rather a solemn and elevating one, and can only be compared with the mighty impression which a visit to Alpine regions always leaves behind."

. The feeling infinite; so felt
In solitude, where we are least alone;
A truth which through our being then doth melt,
And purifies from self.

The impression produced on M. von Baer's mind by this peculiar stillness was, that the morning of creation was dawning for the first time, and that life was yet to follow ; an idea which, when once conceived, he found it impossible to repress.

In other regions, the leaves of tall plants and trees, usually, by their rustling, give indications of the slightest breeze ; but in this land of silence, unless the wind be high, it does not ruffle the lowly plants which there find their habitation. "One might take them to be painted."

We have already spoken of the decrease in the number of species of insects, as we recede from the equator, and that ten species constitute the whole of the known insects of Nova Zembla ; but what is yet more remarkable, these also are noiseless. "On sunny days, and in warm spots, a humble-bee is sometimes seen flying about the small projecting points of rock, but it hardly hums. Flies and gnats are rather more numerous ; but even these are so rare, so peaceful, and languid, that in order to see them they must be sought for." The languor of the latter insects was shown by their not inflicting a single bite on the newly-arrived visitors, who appear almost to have longed for a gnat-bite, "merely for the sake of perceiving life in nature." The exceeding rarity of insect life is, however, perhaps most strikingly manifested in the circumstance, that even in carcasses left on the shore, no insect larvæ are found.

The larger animals inhabiting this territory consist of the polar bear, seldom, if ever, seen in summer, a very few reindeer, a small number of wolves, and common foxes, with a rather large supply of polar foxes, and of lemmings. These animals, however, rarely disturb the stillness of the scene, for, with the exception of the very rare reindeer and the lemming, they are all nocturnal : the lemmings, even, which burrow under ground, "coming forth from the earth, and gliding along in straight lines, and then again vanishing into it, appear like spectres ;" the propensity peculiar to this animal, of moving in straight lines, according remarkably with this singular scene, and rendering its appearance little calculated to disturb the general monotony.

The only land birds known to inhabit Nova Zembla are, the snow bunting, the great snowy owl, and a species of falcon; but the shores, owing to their proximity to the continent, become in the summer season the resort of vast numbers of sea-birds. These coasts are also peopled with various tribes of sea mammalia, including the walrus, three species of seal, the dolphin, and occasionally the narwhal or sea-unicorn.

Spitzbergen, called also East Greenland, consists of an assemblage of ice-clad islands, the general aspect of which is gloomy and sombre, though picturesque. The shores are rugged and bold, in many places consisting of lofty and inaccessible rocky cliffs, bare and black, towering to a considerable elevation, whilst the entire face of the country is dreary, diversified only by mountains with sharp-pointed summits, some of which exceed 4000 feet above the level of the sea. The long duration of sunlight causes the snow on these summits to be melted in summer; but the valleys never lose their icy coverings, and glaciers of immense size and magnificence are formed.

Yet even this inhospitable climate is not utterly destitute of vegetation, some plants being found which brave the rigour of almost perpetual frost; but, as will be anticipated, they are of minute size, and generally present a crabbed and wretched appearance. The dwarf willow, the most vigorous of all, here scarcely rises two inches above the ground. The remaining plants consist of the cochlearia, ranunculus, some species of saxifrage, &c., and several kinds of lichen.



Dwarf Willow.

The principal animated inhabitants of Spitzbergen are the polar bear, polar fox, and some other animals whose range

extends along the arctic circle. Its shores abound with the walrus, seal, and other marine mammalia; and its seas were at one period remarkably prolific in the Greenland whale, but these have been chased from their ancient station by the rapacity of man, and have almost deserted the vicinity of Spitzbergen.

CHAPTER XIV.

CENTRAL LINE OF MOUNTAINS IN ASIA.—ASIA MINOR.—
 SYRIA.—PALESTINE.—ARABIA.—ARMENIA.—CAUCASUS RANGE.—PERSIA.

. Here thou behold'st
 Assyria and her empire's ancient bounds,
 Araxes, and the Caspian Lake; thence on
 As far as Indus east, Euphrates west.
 And e'en beyond: to south the Persian bay:
 And inaccessible th' Arabian drouth.—MILTON.

THE Grand Central Axis, in its continuation across the vast regions of Asia, next demands our attention. We have traced the Balkan range to its termination on the extreme borders of Europe, and we find the central line prolonged in Asia Minor, by the extensive mountain system of the Taurus, which covers a large portion of the peninsula of Asia Minor, or Anatolia.

The Taurus range bears, in Mysia, the ancient names of Ida and Temnon, and in Phrygia and Bithynia it forms the range of Olympus; whilst in its continuation in Paphlagonia, it is distinguished by the name of Olgassys. The name of Taurus is more restricted to the lofty ranges which traverse the southern portion of Asia Minor, from which many lateral branches extend. In this part is situated the extinct crater of Mount Argeus, rising up abruptly from a broad extended base, to the elevation of 13,100 feet above the level of the sea.

The mountain ranges of Asia Minor support an elevated plateau, or table land, which occupies all the central districts,





Cedars of Lebanon.

presenting a succession of extensive and fertile plains, possessing, from their height above the sea, a cool and temperate climate. Between the mountain ranges and the Black Sea, a narrow strip of low land occurs, on an average about twenty-four miles in width, and covered with dense forests, which extend up the declivities of the mountains to the elevation of about 4500 feet above the sea. This mighty mass of trees is known to the Turks by the significant appellation of *Agatch Dagnis*, or "the sea of trees." The scenery on this coast is described as highly beautiful and picturesque, presenting, especially in its eastern limits, one continued garden of azaleas, rhododendrons, and myrtles, whilst in the rear of "the sea of trees" rise the mountain crests to the height of 5000 or 6000 feet.

The vegetation of this region is rich and varied, and Asia Minor forms the original habitation of a large number of valuable plants, now almost naturalized in Southern Europe. The pine, fir, and juniper, occupy the most elevated spots: we here also meet with the cedar of Lebanon; whilst evergreen oaks, as well as some deciduous species, are peculiarly abundant. The beech also prevails in *Caramania*, *Bithynia*, *Paphlagonia*, *Pontus*, and *Colchis*; in which districts many of our fruit-trees, such as the plum, cherry, apricot, almond, medlar, quince, apple, pear, chesnut, mulberry, fig, and vine, are met with growing wild in the heart of the forests. Vast tracts are also covered with olive, myrtle, and arbutus, laurels, pomegranates, pistachio nuts, rhododendrons, &c.; whilst the ground is adorned with the hyacinth, tulip, garden ranunculus, and several kinds of iris.

The mountains of *Amanus* diverge from the *Taurus* range, which they connect with that of *Lebanon*. The latter range traverses the whole of *Syria*, towering to a considerable elevation; many of the summits being covered with perpetual snow. In its southern course, this range forms two branches, known to the ancients as *Libanus* and *Anti-Libanus*, which enclose a broad valley, familiar to the student of ancient history as *Cœlo-Syria*. On the declivities of the mountains of *Lebanon* are still found a small number of the long-celebrated cedars of *Lebanon*, which, in the days of king

Solomon, were so abundant, but which, in 1836, did not (of large size) exceed four hundred in number.

The plains of Syria, and more especially those in the southern districts, are celebrated for their beauty and fertility: their vegetation resembles that of Palestine; but in the northern districts, near Aleppo, the date, orange, and lemon will not succeed without shelter, which arises from the excessive climate of this part, the winters being sometimes severe, though the summers are extremely hot. The damask rose, once well known as a choice ornament of our gardens, though now nearly superseded by modern varieties, is supposed to have been originally brought from Damascus at the time of the Crusades.

Judea now, and all the promised Land.—MILTON.

The mountains of Palestine diverge from the range of Libanus, but are by no means elevated, Judea being rather a hilly, than a mountainous, country. Its principal eminences, Carmel, Tabor, and Abarim, do not rise in bleak and rugged peaks, but present picturesque and gradually rising hills, the slopes of which are adorned with vineyards, whilst they are clothed to the summit with luxuriant woods and the richest pastures, and the clefts of the rocks are inhabited by innumerable bees, so that they may almost literally be said to flow with milk and honey. The valleys of Judea are exuberantly fertile :

Where stately Jordan flows by many a palm,
Or where Genesaret's wave,
Delights the flowers to lave,
That o'er her western slope breathe airs of balm.

Of a far different character is the desolate territory in the neighbourhood of Lake Asphaltites, or the Dead Sea, where the surface is only varied by fearful precipices, so lofty as to exclude the rays of the sun from the deep and dreary glens they enclose; whilst the massive rocks, apparently rent and shattered by some mighty convulsion, assume a thousand fantastic forms. Among these "desolate hills, this calcined barrenness," numerous deep caves occur, which, under the first Dispensation, served as places of refuge to the persecuted

prophets and people of God, and which, in later times, also sheltered the Christians of the East.

Judea having been the land selected by the Most High for the abode of His chosen people, and being described in Holy Writ as "a good land," we are naturally led to inquire in what its peculiar excellency consists. Nor will the reply prove unsatisfactory; for we shall perceive that this country is no less distinguished for its great fertility, than for possessing a climate, singularly adapted to favour the luxuriant growth of the most important vegetable productions, both of temperate and of hot regions. Bordering, as this land does, upon the Mediterranean, or "Great Sea," and traversed by hills of sufficient elevation to attract moisture, though not so high but that they admit, in this latitude, of cultivation to their very summits, it enjoys sufficient supplies of rain to ensure its fertility, whilst in the months when those are suspended, copious dews water and refresh the thirsty land. The inequalities of its surface at the same time favour the growth of the various vegetable productions of different zones, some of which succeed in the low plains and valleys, and others in the more elevated districts. From Tripoli to Sidon, the country is much colder than the rest of the coast further to the north and to the south, and its seasons are less regular. The same remark applies to the mountainous parts of Judea, where the vegetable productions differ from those on the sea-coast. Owing to their greater elevation, again, some parts of Galilee are very fresh and cool, whilst at the foot of Mount Tabor and in the plain of Jericho the heat is intense.

Wheat, barley, rye, beans, maize, rice, dhoorah, and sesamum, all flourish in this territory; but there is much reason to believe that the latter grains are comparatively modern introductions, and that the "parched corn" of the country, of which the children of Israel partook on the day the manna ceased, was of that description distinguished among us as bread-corn. According to the representation on an ancient Jewish coin, it appears that the wheat at that period cultivated in Palestine, though perhaps a bearded wheat, was not the Egyptian species.

We here, also, meet with the greater number of forest trees

already mentioned as occurring in Southern Europe, and all the fruit trees which adorn those regions, such as the orange, lemon, pomegranate, mulberry, fig, olive, pistacia, and vine; together with the tamarind, date, and plantain. But it is not the mere occurrence of these various plants, but rather the superiority they here attain, which renders this region remarkable. The olive trees and pomegranates grow to an unusual size, and the figs are of the greatest excellence; but the most distinguished among the vegetable productions of Palestine are the vines. And not only are these plants of extraordinary size in this region, but the bunches of grapes are described by modern travellers as weighing from ten to twelve pounds, and the grapes as of the size of plums. Of similar character may have been the cluster of grapes brought from the brook Eshcol, by the men who were sent from Kadesh to spy the land: and thus literally do we find this country to be "a land of wheat, and barley, and vines, and fig trees, and pomegranates; a land of oil-olive, and honey;" an "exceeding good land."*

In consequence of the size and peculiar excellence of the fruit of the vine in this country, it has been supposed to be the aboriginal habitation of that plant. However this may be, (and it is a question very difficult to solve,) the vine is now found flourishing without cultivation in Judea, though by no means solely in that territory; for it will be remembered, we have already met with it in other regions. These vines which grow wild are, however, totally distinct from the "wild vines," and "wild grapes," spoken of in various parts of Scripture; and the latter are supposed to be a species of nightshade, the *Solanum sodomæum*, producing fruit, probably of tempting appearance, but of poisonous nature. This plant, at the present day, grows on the shores of the Dead Sea, and its fruit is subject to be internally destroyed by an insect; so

* Some conception may be formed of the remarkable productiveness of the fruit-trees of this region, by the following extract from Colonel von Willdenbruch's *Journal*: "Lemon-trees bear fruit throughout the whole year. A single tree in my garden yielded the full supply for my household, which was very considerable; and yet, regardless of the large consumption which was made use of in the kitchen for sherbet, lemonade, &c., all wooden utensils, kitchen tables, &c., were cleaned with the acid of the lemon."



Date Palm Tree.—*Phoenix Dactylifera*.

that, although it retains its form and colour, it contains nothing but dust. And it may be reasonably inferred that this is the plant spoken of by ancient authors as bearing

. . . . The apples on the Dead Sea's shore,
All ashes to the taste.

The terebinth tree, or pistacia terebinthus which we have before met with in southern Europe, and especially in the islands of Greece, is a native of Palestine, and is considered to be the species of tree rendered "oak" in our translation of the Bible. It is from these trees that the Terebinthine Vale, or Valley of Elah, obtained its name: a spot renowned in Sacred History as the scene of David's victory over Goliath. "The husks," which, in the beautiful parable of the Prodigal Son, we read "that the swine did eat," are supposed to be those of the carob, or eastern locust tree, which are still commonly employed in Palestine for feeding cattle. The sycamore tree of Scripture, (into which Zaccheus climbed, and of whose fruit the prophet Amos describes himself as "a gatherer,") differs totally from the species of maple commonly known by that name in our country, and is, in fact, a species of fig-tree, bearing a sweetish, watery, and somewhat aromatic fruit, which comes to maturity at various seasons of the year. The palm tree of Scripture, is the date palm, which in Palestine forms groves of exceeding beauty; and the "palm branches" which the people took when they went forth to meet our Lord, on his triumphal entry into Jerusalem, were the leaves, or fronds, of this valuable tree.

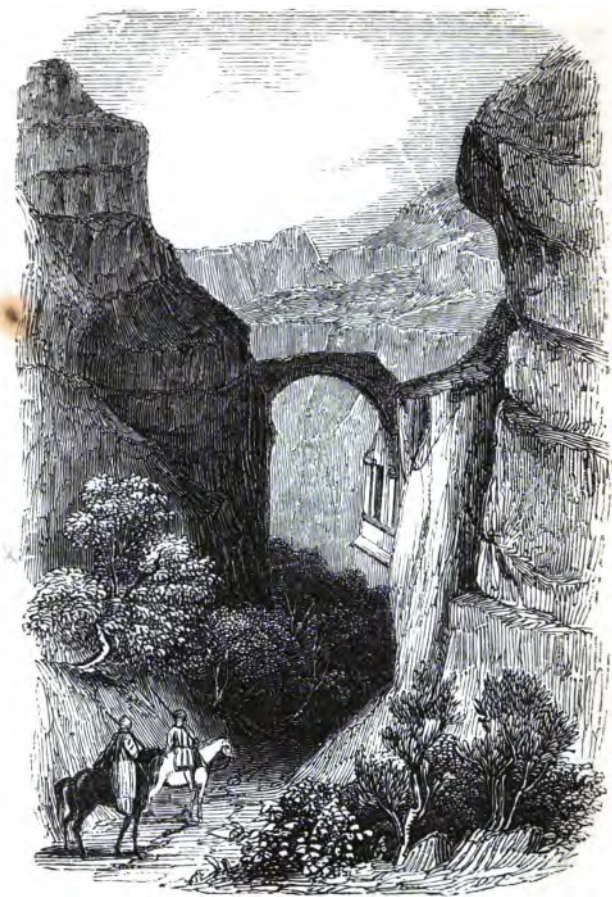
Ancient and modern writers combine in rendering testimony to the beauty and fertility of this land. Tacitus speaks of the fruitfulness of the soil, exuberant in its produce, like that of Italy, and yielding the palm and balm tree. Justin also speaks of the exuberant produce of Palestine, and its beautiful climate. "Under a wise and beneficial government," says Dr. Clarke, "the produce of the Holy Land would exceed all calculation. Its perennial harvest, the salubrity of its air, its limpid springs, its rivers, lakes, and matchless plains, its hills and vales,—all these, added to the serenity of its climate, prove this land to be indeed 'a field which the Lord hath

blessed: God hath given it of the dew of heaven, and the fatness of the earth, and plenty of corn and wine.' ”

Beautiful and fertile as was the land of Judea, it was not without some attendant natural evils, which, in the language of prophecy, are often introduced, both as threatenings of punishment to the disobedient, and as types of still greater calamities. Earthquakes, volcanos, drought, whirlwinds, the pestilential khamain or simûn, and the devastation of locusts, have all at various periods visited this country. The latter, emphatically termed the “army of the Lord,” sometimes appear in countless hosts, occupying a space of two or three miles in length, by a mile and a half in breadth, and in such dense masses as to obscure the light of day.

The lion was anciently common in this territory; but this formidable animal appears to be unknown at the present day in this part of Asia. In a country so anciently, and so populously inhabited, as was Palestine, the native animals become in great measure lost to our view, and superseded by domestic species. Sheep, goats, oxen, camels, and asses, appear to have been included among the latter from the remotest antiquity; whilst among the wild animals were the roebuck, antelope, hare, coney, jerboa, chameleon (fig. 146), &c. &c.

To the south of Palestine lies the mountainous and desolate tract of Idumea, or the land of Edom, now included in Arabia Petrea, forming a strong contrast to the fertile regions we have just been considering. And yet this land appears also to have been highly productive in ancient times. It is not, however, impossible that its former fertility may in great measure have been attributable to the high state of cultivation in which every part seems to have been maintained, in its days of prosperity. Be this as it may, the whole country is now nearly desolate, and its once flourishing cities laid in ruins, and almost without an inhabitant. This territory is remarkable for its bold and precipitous rocks, in the clefts of which its ancient inhabitants made their dwellings. The remains of the works of man found in this region fully attest its ancient importance, and the remarkable change which has occurred in its condition; its natural features are likewise of



Approach to Petra.

a description to strike the beholder with awe and amazement. The narrow defile by which the now desolate city of Petra* is approached, may convey some idea of the character of the scenery.

Of a very similar character is the peninsula in which the Wilderness of Sinai is situated, and where we meet with the holy Mounts of Horeb and Sinai. The Wilderness of Sinai is described by M. Laborde, as "one of the most singular scenes that imagination can picture," consisting of a deep valley, or ravine, fifty paces in width, shut in by immense masses of granite, often rising perpendicularly to the height of from one thousand to twelve hundred feet, with huge fragments scattered at their base, assuming the most extraordinary forms, and presenting caverns and fissures of fearful aspect. The country at the foot of Mount Horeb is equally wild; and the whole district, from thence to Ezion Gaber, consists of a frightful desert, appearing like a troubled sea, suddenly petrified. The desert tract lying to the north of this remarkable mountain group, and which is named el Tyh, i.e., the Wandering, from its having formed the scene of the wandering of the Israelites, consists of a vast plain, with a cretaceous or chalky soil, but sandy, stony, and in some parts covered with flints, and destitute of vegetation.

Although Arabia contains some fertile *wadys*, or narrow well-watered valleys, the general character of the country is that of bare rocks and barren sands. The deficiency of moisture, combined with the high temperature incident to its situation, within or near the tropic of Cancer, may be considered as the cause of this desert character. This deficiency of moisture may in great measure be attributed to the position of its mountain ranges, and the nature of its soil. The former, generally speaking, are not of great elevation, and do not form a ridge through the centre of the country, but encircle it in those parts where it borders on the sea; the consequence of which is, that the vapour becomes condensed and deposited on these mountains; and instead of falling in fertilizing showers in the interior, rushes down in torrents

* In Scripture called Bozra.

rather than rivers, from the mountains and rocks, and after diffusing verdure over valleys of small extent, all the moisture is lost and absorbed in the sand. The interior of the country is, however, little known.

The coasts bordering on the Red Sea present ranges of barren mountains, where, generally speaking, not a trace of vegetation is to be seen. The southern coast is little less dreary; but the mountains in that part of Arabia recede further from the coast, leaving a broad plain, in which is situated a remarkable belt of low sandhills, which are so loosely held together, that they change their outline, and even shift their position, with the prevailing wind. These hills rise in sharp ridges, and are all of a horse-shoe shape, a form which appears to be usually assumed by sandhills of this description; and, notwithstanding their liability to change their position, they are not wholly destitute of vegetation; a few stunted acacias being met with, and also the arak tree, which adorns with its lively green foliage this and some other of the most desolate regions of the earth. In the south-eastern districts, near the town of Muscat, the mountains rise abruptly from the sea; but in their northern course through the province of that name, they leave, between their base and the sea, a tract occupied by numerous ravines and valleys, which display the richest vegetation, being adorned with noble forest trees, and with luxuriant groves of almond, fig, orange, citron, and other valuable trees. This range of mountains, from the fertility of these valleys, has acquired the name of *Jebel Akdar*, or the *Green Mountains*. The highest summits in this range reach the elevation of six thousand feet above the level of the sea.

To the westward of the *Jebel Akdar* extends the *Great Desert*, unvarying and desolate in its appearance, and apparently occupying a considerable surface in the interior of the country. The district to which the designation of *Arabia Felix* has been applied appears little deserving of that name, a nearly continual drought rendering this part generally unfit for cultivation; and the *dhoorah* is almost the only grain which succeeds. Indeed, "*Araby the Blest*" appears rather to have acquired this appellation, from having been the emporium

and channel of transporting into Palestine and Europe, various spices and odoriferous gums, as well as other valuable articles brought from India and Eastern Africa, than from possessing any such products peculiar to its own soil, of which, nevertheless, they were long considered natives.*

The indigenous vegetable productions of Arabia are comparatively little known: and though it would appear, from the accounts of modern travellers, that this territory is not so generally destitute of vegetation as had long been supposed, yet, owing to the dryness of the climate, grasses are very scanty, and rushes nearly unknown; whilst cryptogamic plants, whose existence depends so much on moisture, seem to be wholly wanting. The forest trees are confined to the mountains and the adjacent valleys. Among these, the most numerous are various species of fig trees; but one of the most conspicuous is the *Keura odorifera*, a superb tree, in some respects resembling a palm, and much prized on account of the delicious and powerful odour it exhales. The *Acacia arabica* (fig. 72), from which gum arabic exudes, may also be ranked as a native of this country. Gourds of various species (plants in which the camel especially delights) are abundant in the more fertile districts; whilst the more sterile sandy parts produce the liquorice plant, and also the gharkad, which latter is a thorny shrub, bearing a small red berry, very juicy and refreshing, and much resembling a ripe gooseberry. This fruit arrives at perfection in the height of summer, when the ground is parched up; "exciting," says Burkhardt, "an agreeable surprise in the traveller, at finding so juicy a berry produced in the driest soil and season." In some parts of the coast bordering on the Red Sea, a narrow sandy tract occurs at the base of the mountains, distinguished by the appellation of Tehâma; and in this district, palms form the prevailing trees. Among its cultivated plants, Arabia includes many of considerable importance. One of the most prominent of these is coffee, which, though not con-

* This erroneous impression appears to have originated in the circumstance of Herodotus and other ancient authors having included, under the general name of "Arabia," the whole territory to the east of the Nile, some districts in the African portion of which we shall find singularly rich in aromatic products.

sidered to be a native of Arabia, arrives at its highest perfection in the most favoured parts of this region. This plant grows to the height of forty or fifty feet, with a stem four or five inches in diameter, and is cultivated on artificial terraces, on the slopes of the mountains. Arabia produces balsam, frankincense, myrrh, and other odoriferous gums; though, as we have just seen, the plants from which they are obtained are not considered indigenous to this country. Balsam, or balm, is the produce of the *Amyris opobalsamum*; myrrh of the *Amyris kataf* (fig. 46). Frankincense is obtained from the *Juniperus lycius* (fig. 163), though this is of inferior quality, the true frankincense, or olibanum, being the produce of the *Boswellia serrata*, an East Indian plant, and unknown in Arabia. The beautiful tamarind tree (fig. 70) is cultivated for its valuable fruit; and date palms are very abundant; whilst in the southern districts, we meet with the cocoa-nut palm. In the latter portion of this territory, stapelias, mesembryanthemums, and other African genera, make their appearance; and aloes are very numerous, six different species being known as inhabitants of Arabia, among which is the splendid *Aloe soccotrina* (fig. 191), the native habitation of which appears to be the small adjacent island of Socotra.

The native animals of Arabia include monkeys, panthers, lynxes, hyænas, the jackal, jerboa, hyrax, or coney, &c. The principal domesticated animals are the celebrated Arab horses, (which, however, are not considered as aboriginal natives of this country,) and the Arabian camel, or dromedary (fig. 81). Col. Chesney mentions that, in crossing the dreary plains of this region, the traveller is cheered by the song of the nightingale, which takes its station in the liquorice bushes. Locusts of various species periodically visit and devastate Arabia. These insects form an article of food with the natives, being commonly exposed for sale in the markets; they are considered wholesome and nutritious.

It will now be desirable to return to our grand central line, which we find prolonged in the elevated plateau of Armenia. This remarkable highland, between Trebizond and Mósul, has

a width of 360 geographical miles,* preserving a general level of six thousand feet above the sea; but towards its southern termination, the mountains of Juwar Tagh are said to reach the elevation of fifteen thousand feet, and from thence the descent is almost abrupt, to the low level plains of Mesopotamia. This highland has, as will be supposed, its elevations and depressions; thus, Erzurúm is seven thousand feet above the sea, and consequently possesses a cold climate; whilst the fine plain in which Mush is situated, which is 4700 feet above the sea, is one of the richest in the Turkish dominions; and the remarkable valley of Bitlis is little more than three thousand feet above the sea level. This valley, which is entered by three ravines, is filled with orchards, and irrigated by numerous streams and springs; whilst bare limestone mountains rise on every side, to the elevation of about two thousand feet above the valley, in the centre of which stands an abrupt rock, about sixty feet in height, crowned with an ancient castle; "the whole," observes Mr. James Brant, who visited this spot in 1838, "combining to form a prospect as singular as interesting." In the highland of Armenia is situated the salt lake of Van, which is 5470 feet above the sea. On the borders of this lake, rises the mountain of Supan Tagh, 9500 feet above the sea, and full 4000 feet above the lake.

In this elevated land are also situated the wild and picturesque mountains of Lázistán, which are chiefly composed of volcanic rocks, forming in one part an entire mountain of the beautiful volcanic glass called obsidian. These mountains are singularly wild in their character, with high perpendicular cliffs and terrific gorges, interspersed, however, with beautiful and picturesque valleys, adorned with almost every species of the various fruit trees met with in temperate zones, growing in the utmost perfection. The general character of these mountains is, nevertheless, bleak and rugged, and several of the summits attain a great elevation above the sea, being covered with perpetual snow.

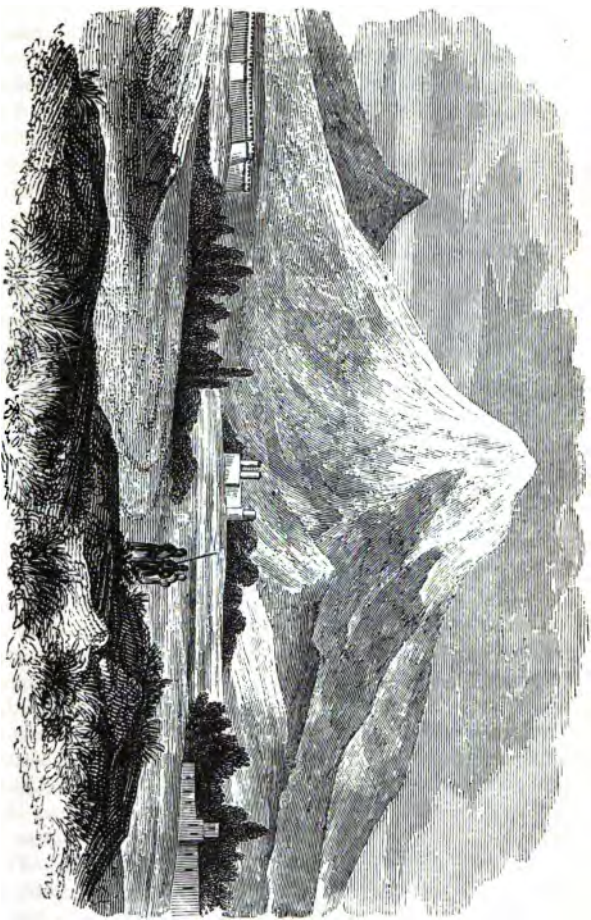
Continuing our course to the eastward, the beautiful peaks

* About 413 statute miles.

of the Greater and Lesser Ararat burst upon our view. The whole country in this vicinity is full of traditionary stories relative to Noah's ark and the Dleuge; and the Armenians, as soon as they see Ararat, kiss the earth, and repeat certain prayers. They call it "the Mountain of the Ark;" and the Persians designate it as "the Mountain of Noah." The height of this imposing and snow-capped mountain is 17,260 feet above the level of the sea.* Mr. Hamilton, who visited this spot in June, 1836, says, "It is impossible to describe the effect produced by the first view of this stupendous mountain, rising in majestic and solitary grandeur, far above the surrounding hills and mountains. The morning was beautifully clear, the sun had just risen, and not a cloud, or particle of vapour, obscured its striking outline: and it was impossible to look on this mountain, so interestingly connected with the early history of the human race, without mingled feelings of awe and wonder." The Greater Ararat is covered with perpetual snow, but the Lesser Ararat loses its icy covering in summer. Mount Ararat is considered to be of volcanic formation; indeed, the whole country appears to rest on a basaltic base. Mount Sevellan, the height of which is 13,000 feet above the sea, is the most elevated summit in this district next to Ararat; and seems to consist of the cone of an extinct volcano.

The whole of the region we have now been considering, is remarkable for the abundance of fruit-trees which grow in its plains and valleys; indeed, the country on the western banks of the Caspian is supposed to have formed the original habitation of most of our choicest fruits; and it is from hence that the apricot (fig. 62), has obtained its name of *Prunus armeniaca*. In the low plains of Mesopotamia, watered as they are by the Tigris, the Euphrates, and their tributary streams, vegetation flourishes luxuriantly; and the date-palm winds along the course of these rivers, extending to Bagdat on the one side, and overshadowing the ruins of Palmyra on the other. The banks of the Tigris beyond Bagdat are fringed with cucumbers (fig. 19), and with weeping-willows (fig. 108). It is not a

* The convulsions which have recently occurred in this mountain will be noticed in a future page.



Mount Ararat.



little remarkable, that, desolate, and converted into a heap of ruins, as is the once "great Babylon," some apparent vestige of its celebrated hanging gardens should yet remain. This consists of a solitary tree, a species of tamarisk, not considered a native of this region; but which still possesses a verdant top, and occupies a ridge near the ruins of an ancient palace.



Tamarisk Tree on the Ruins of Babylon.

In the higher parts of the plateau of Armenia, a totally different climate prevails from that experienced in the low plains; its great elevation above the sea, rendering the climate cold, and in some parts even severe, and therefore totally unfavourable for the growth of plants of warmer regions. Thus, at Erzurúm, the ground is seldom free from ice and snow until the middle of April, and snow sometimes falls in the middle of the month of June.

The Grand Central line is next continued in the range of mountains which extends along the western shores of the Caspian Sea, forming the boundary of the vast plains of Bucharia, and which is historically famous for containing the Bactrian, Parthian, Hyrcanian, and Caspian mountain passes;

these ranges being now known as the Elburz, or Elburj, and Parapomisan Mountains. The summits of the Elburj do not generally exceed 7000 feet, but the loftiest peak, Mount Demavend, a volcanic cone, is 14,700 feet above the level of the sea. The Parapomisan range does not appear to present any very elevated summits, but gradually blends in with the vast mountain mass of the Hindoo Koosh, or Hindoo Koh; the latter being an extensive Alpine region, which we may consider as a knot in our grand central axis; for, from that point, diverge all the mountain ranges of Asia. But since the Hindoo Koh, as its name indicates, may be considered as belonging to the Indian mountain system, it will be desirable, before proceeding to any description of its features, to retrace our steps, and turn our attention to the principal ranges diverging from that portion of the central line which extends from the borders of Armenia to those of Hindostan.

The most remarkable of these, if indeed it can be considered as connected with our central line, is the lofty and extensive range of Caucasus. The central portion of these mountains is entirely composed of porphyry, and is described as consisting of a plateau, 8000 or 10,000 feet above the sea, which is rent in every direction by deep and narrow valleys, and traversed crossways by a ridge of rugged and picturesque rocky eminences, the summits of which are covered with perpetual snow. The highest point is Mount Elbourz, 16,500 feet above the sea, situated on the northern border of the highly fertile and beautiful country of Georgia. The latter country is, perhaps, scarcely exceeded in the richness and variety of its vegetable productions by any region in the globe. Watered by numberless streams flowing from the elevated range of Caucasus, and screened on the north by those mountains, the plants of tropical climates succeed in its valleys, whilst those of temperate regions flourish luxuriantly in the more elevated plains, and the sides of the mountains are adorned with magnificent forests of beech, ash, chesnut, oak, and pine. Between Georgia and the Black Sea, is situated the ancient Colchos, now called Mingrelia and Imiretta. The interior of this tract is mountainous, but the lower parts, near the Black Sea, are remarkable for their humidity. Innume-

nable streams flow down into this territory from the Caucasus range, and, uniting their waters, form no less than thirty considerable rivers. This redundant moisture renders the soil and climate unfit for cultivation, but fruit-trees of every description grow spontaneously; though some species of fruit are affected by the moisture of this region, and are more juicy than well flavoured. Chesnuts, figs, and grapes are, however, very fine.

The animals inhabiting the Caucasian regions include the lynx, a small species of tiger, the bear, urus, chamois, a species of ibex, and several antelopes.

Extensive mountain branches diverge to the south of the grand central line, constituting the mountain systems which support the table-lands lying between the plains of Mesopotamia and the River Indus. At their western extremity, Koordistan presents a vast succession of hill and valley, dell and plain, of the greatest fertility, flanked by mountains of towering elevation; the summits of the great range of Zagros, or Luristan, its modern appellation, which runs nearly parallel with the Euphrates and Tigris, rising to an elevation exceeding 14,000 feet above the level of the sea. The "colossal Goodrun" is said to contain a glacier, affording an inexhaustible supply of ice, with which it furnishes all Koordistan. The eastern support of this plateau is formed by the range of Solimaun, which diverges from the central line, near the Hindoo Koh, attaining the height of 12,000 feet above the sea level; whilst its southern boundary is formed by the mountains of Beloochistan.

The elevation of the plains of Persia above the level of the sea (about 4000 feet) renders the climate mild, and adapted to the growth of plants of temperate regions; and accordingly we find the currant, cherry, apricot, peach, and others of our well-known cultivated fruit-trees, flourishing in these plains, the peach having been obtained from thence. The celebrated wine of Shirauz bears testimony to the perfection attained by the vines of Persia; roses also grow luxuriantly, appearing in the form of trees. The cypresses of Shirauz, so famed in Oriental song, have almost entirely disappeared, having been unmercifully cut down for common

carpentry, doors, window-frames, &c. The whole of this territory is, however, by no means equally fertile. Instead of being traversed by a mountain ridge, we have seen that it is surrounded on all sides by elevated ranges: these arrest and condense the moisture, and the consequence is, that the interior of the country (in the centre of which there is a considerable depression) is arid; and it is only in the districts bordering on the mountains that any streams occur, or that this great fertility prevails. The vegetable productions of Cabool, which forms the north-eastern portion of this table-land, are very similar to those of Southern Europe, the cultivated plains being covered with mulberry, oriental plane, poplar, and several species of willow, and the mountains with various species of pine and fir. A flat district extends between the mountains of Beloochistan and the sea, which is very sultry, but favourable to the growth of the palm, mango, guava, and other tropical plants.

Among the native animals of Persia are the spalax, or blind rat; the brown rat, improperly called the Norway rat, but which originally came from this part of Asia; the dorcas antelope; Persian gazelle, with its "soft black eye;" fallow deer, common hare, brown bear, lion, ounce, &c. &c. Its domestic animals include both the Bactrian camel and the dromedary; and the Persian horses rank second only to those of Arabia.

CHAPTER XV.

THE HINDOO KOH.—HIMALAYA MOUNTAINS.—CHINA.—
INDO-CHINESE COUNTRIES.—HINDOSTAN.—ISLANDS OF
ASIA.

The mountains huge appear
Emergent, and their broad backs upheave
Into the clouds, their tops ascend the sky.—MILTON.

THE mighty Alpine system, to which is applied the name of Hindoo Koh, or Indian Mountain, forms the commencement of the vast Indian range, which bounds Hindostan on the north, and extends to the most eastern valleys of

Assam or Asam—a distance of nearly 2000 miles. The general elevation of the Hindoo Koh is very great, and a considerable number of summits in this group are covered with perpetual snow. The mountains in this range are intersected by some fertile valleys, but their declivities are in general destitute of trees. Barley succeeds at the elevation of 10,000 or 11,000 feet above the sea; and human habitations are met with at about the same level, though the occupiers of these dwellings are, during six months of the year, prevented by the deep snow from quitting them.

The range of the Tibet Panjahl connects the Hindoo Koh with the stupendous Himalaya Mountains. The highest points in the Tibet Panjahl, are Mer and Ser, which are both pyramidal mountains, the one black and the other white, situated near each other, and rising in almost unparalleled majesty above the boundless regions of snow, formed by the inferior summits of this range.

Nearly parallel with this portion of the Grand Central line an elevated ridge of mountains extends, constituting the separation between the upper basin of the river Indus and that of the Shayuk. Some conception may be formed of the general elevation of this mountain region, when we consider that the greater number of the *passes* have an altitude exceeding 18,000 feet above the sea level, whilst the Marsi Niglak Pass, which was crossed by Lieut. H. Strachey, nearly attains the height of 19,000 feet, the latter being the most elevated, hitherto traversed by Europeans. Lieut. Strachey gives a description of a valley situated among these mountains “of singular grandeur, being flanked for ten miles by stupendous precipices of granite, thousands of feet high, so sheer that they seem cut out by art, and so steep that nothing living can scale them.” It is among the recesses of this mountain group that the finest shawl-wool is produced; the shepherds who tend the flocks of Tibet goats taking up their *winter* quarters in valleys at the elevation of about 13,000 feet; whilst in the warm season—since, as the snow melts on the more elevated acclivities, fresh herbage usually springs up—the *summer* range of the Tibet goat and other herbivorous animals inhabiting these regions, follows the

melting of the snow to the utmost limit of the growth of plants suited for their sustenance.

The pre-eminently lofty and extended Himalaya Mountains take a general south-easterly course, and terminate at the Brahmapootra river. The enormous mass of snow among these mountains, the vast icicles pendant from the rocks, the magnificent blue glaciers which fill the gorges and gullies, and some of the valleys, and the numerous snow-crowned summits, towering to a stupendous height, fill the beholder with awe and amazement. Nor is this rendered less impressive by the still silence which prevails in these elevated regions, the absence of all living and moving things. Among these lofty summits the highest (the altitude of which has been correctly ascertained) is Kinchin-jinga, which has an elevation of 28,174 feet above the level of the sea; but Dhawala-giri, or the White Mountain, is yet more lofty, being considered to attain the height of about 28,800 feet. Some of the summits in this mighty range, are surmounted with coronets of snow two or three hundred feet in depth, and it appears remarkable that even in these elevated regions, removed as they would seem to be from disturbing causes, whether atmospheric or terrestrial, the snow does not long retain its bright appearance, and it is only after a recent fall that it presents an aspect of dazzling whiteness. Beyond the peak of Chumulari, the Himalaya Mountains take a nearly due easterly course for about two hundred miles, then, turning to the north, terminate in the group which forms the source of the Brahmapootra River. This portion of the range also contains a vast number of snow-clad peaks, but towards its eastern limits it appears to diminish in elevation. The Harpala range connects the Indian mountain system with that of China.

China is a very mountainous country, half its surface being occupied with mountain ranges, in many parts too steep to admit of cultivation, but which are covered to a considerable elevation with fine trees, and intersected by narrow and remarkably fertile valleys. The most lofty mountain range is that which bears the name of the Yungling, or Sine-ling (*i. e.* Snowy Mountains). This range extends from north-east to

south-west; and four other ranges, nearly parallel with each other, cross the country from east to west; of these, the Nan-ling is the most elevated, as well as the most extensive, and contains some snow-clad peaks. The mountain system of China extends to the borders of the Pacific, the Nan-ling range, or a branch from those mountains, reaching the borders of the ocean near the volcanic island of Formosa, which may be regarded as the termination of our Grand Central Axis.

We have now traced the central mountain band of the Old World, from its commencement on the shores of the Atlantic, to its termination on those of the Pacific. And, when we consider the effects of elevated land in arresting and condensing atmospheric moisture, and also in modifying the temperature of any region, we cannot but be sensible that this mighty ridge forms a very remarkable feature, in the physical geography of this portion of the globe, imparting to it a great diversity of climate, adapting it for the habitation of an almost endless variety of animal and vegetable productions, and also giving rise to numerous vast and important rivers; thus, not only rendering the regions it traverses remarkably varied and beautiful, but increasing their fertility, and their fitness for the abode and sustenance of immense numbers of the human species.

Before considering the northern branches which diverge from the mighty mountain knot of the Hindoo Koh, it will be desirable to turn our attention to the natural features of the regions situated to the south of the mountain ranges, which extend from that point to the Pacific.

. To Paquin of Sinean kings
And thence to Agra and Lahore of Great Mogul.—MILTON.

China, being much diversified in its surface, possesses a corresponding diversity of climate and of vegetable productions. It is, however, so completely a cultivated country, that its actual indigenous plants can scarcely be determined. The mountainous districts are carefully planted with oaks, pines, and other forest trees, whilst the hills in some districts are covered with camellias, or crowned with orange trees, and the bamboo forms forests in the valleys. In the latter localities we also find the cocoa-nut, and other palms, the plantain,

guava, litchi, sugar-cane; the peach, apricot, pomegranate, vine, fig, walnut, black mulberry, white mulberry (fig. 91), cotton (fig. 38), and tea-tree (fig. 29); whilst the sacred bean of India (fig. 3) occurs in the streams. The wax-tree affords materials for candles; and the lacker shrub produces a gum which forms the fine Japan varnish. The orange (of which there are several varieties) as well as the sugar-cane, both now so extensively diffused, are supposed to have been originally natives of this country. In the northern districts, wheat, millet, and sesamum (fig. 205), are grown; but the staple grain is rice (fig. 204), of which perhaps a larger quantity is consumed in China than in any other country on the earth's surface. The curious and beautiful substance, erroneously called rice-paper, is obtained from the stem of a plant not altogether known to botanists, but supposed to belong to the *Malvaceæ*, or mallow tribe. It is naturally of the purest white, and consists of a portion of the stem cut into thin layers or sheets.*

The native wild quadrupeds of China are little known; its birds and insects are numerous and beautiful. Among the former, the pheasants are very conspicuous, including the superb pheasant (fig. 125), ring pheasant, golden or painted pheasant, and silver pheasant. The most remarkable insects are the silk-worm, the lantern-fly, and the gigantic species of moth called the *bombyx atlas*, which measures full eight inches from the tip of one wing to that of the other.

Among the mineral productions of China, we meet with rubies, corundum, topaz, tourmaline, lapis-lazuli, &c. Gold is found, but not in large quantities; and silver occurs, both in its native state, and in combination with other minerals. Kaolin, or porcelain earth, of peculiarly excellent quality, is abundant, imparting to the porcelain of China the superiority for which it has long been celebrated. China is said to be as rich in coal as any country in the world, and in the adjacent island of Formosa, a mine of excellent coal has recently been discovered, which may prove highly useful to our steamers.

* Our readers will remember, that in hot climates the mallow tribe are not, as with us, mere small shrubs or herbaceous plants, but appear in the form of forest trees.

The climate of China is *excessive*; and this country forms an instance of the difference in the climate of regions situated on the eastern shores of the Old Continent, and regions in similar parallels on its western shores. Thus, at Pekin, which is nearly a degree to the south of Naples, the cold is so great, that during the winter, the rivers are said to be frozen over for three or four months; whilst, in the summer months, the heat greatly exceeds that of Southern Italy.

The Indo-Chinese countries, including Tonkin, Cochin-China, Siam, the Birman Empire, Aracan, and the extended peninsula of Malaya, are intersected by various branches from the central line, taking a general direction from north to south, and giving a mountainous character to some portions of this territory. The Aracan, or Anapectu-mew Mountains, separate the Birman Empire from the British dominions.

The mountain districts of this region are covered with extensive forests of teak and other valuable trees, entangled with thick underwood, or jungle, the resort of vast numbers of wild animals. The southern and flat districts are particularly adapted for the cultivation of rice, which forms the staple food of the whole population. The finest sort of gamboge, or camboge, is procured from Siam, and is a gum resin, obtained in the form of a yellow juice from the bruised leaves and young branches of a tree, called *stalagmites*. Asam includes among its indigenous vegetable productions, the tallow tree (fig. 51), pepper plant (fig. 107), tea plant, cotton, sugar-cane, mango (fig. 77), jacca (fig. 97), bamboo, caoutchouc fig-tree, sago palm (fig. 176), betel nut palm (fig. 180), &c.

Among the native animals, are the elephant of Siam (fig. 67), the one-horned rhinoceros (fig. 70), the royal tiger, leopard, &c. Neither jackals, hyænas; wolves, nor foxes, are known in this part of Asia; dogs are very numerous, and are used as an article of food. The ourang-outan, the gibbous, or long-armed apes, and other species, are met with in Malacca, besides several splendid birds, such as the gigantic argus pheasant, crown pheasant, great white cockatoo, and various lories, parrots, and parrakeets, adorned with the most brilliant plumage.

The ruby, sapphire, and amethyst, are among the mineral

productions of this region ; and its metallic treasures are considered to be great ; coal also appears to be plentiful, but is not used as fuel.

Hindustan, or the vast territory included between the Indus and the Ganges, although it is intersected by some branches from the great central line, does not possess any mountains at all approaching in elevation to the stupendous Himalayan range, which forms its northern border. The most lofty mountains are those which branch off from the Tibet Panjahl, and which, with that range, form a regular oval of snowy mountains, nearly encompassing the beautiful and fertile valley of Kashmere ; and on the declivities of which are many thousand acres covered with apple and pear trees, and vines, in full bearing, but without owners. The principal branches which intersect the peninsula of India, are the Vindhya range, (a continuation of the mountains of Guzerat,) the Eastern Ghàts, and the Western Ghàts. The Vindhya range crosses this territory from east to west, forming the northern boundary of the table-land which occupies the centre of the peninsula. These mountains, as well as the Eastern Ghàts, which run parallel to the Coromandel coast, nowhere exceed three thousand feet in height ; but the Western Ghàts, which border the Malabar coast and rise abruptly from the sea, are more elevated, especially in that portion of their course where they approach the Neilgherries, in which part, they are said to attain the height of eight thousand feet. These Ghàts form the western boundary of an elevated plateau, or table-land, of considerable extent and altitude, some of the platforms having an elevation of five thousand feet above the sea, though the general level of the plateau of Dukhun, or Deccan, near the Western Ghàts, is about two thousand feet ; and it gradually declines, occasionally by a succession of low steps, to the Coromandel coast. The natural productions of the latter district assume all the characteristics of those of tropical regions ; whilst those of the elevated table-land approach nearer to the productions of temperate zones.

This elevated plateau affords an interesting geological phenomenon, in the occurrence of the most remarkable trap formation probably existing on the surface of the globe ; there

being evidence of a continuous formation of this description, covering an area of from 200,000 to 250,000 square miles, and this, without the intervention of any other rock whatever, whether at the level of the sea, or at the height of 4500 feet. In treating of geology, we have remarked that the term *trap* was derived from *trappa*, (Swedish for a flight of steps,) because trap rocks occasionally assume that form:—the plateau of the Dukhun affords a grand specimen of this arrangement. The Konkun is a narrow strip of land, lying between the Western Ghàts and the sea, the mean elevation of which is less than a hundred feet above the sea; from this, the Dukhun abruptly rises by a succession of steps, or terraces, to the height of about 1800 feet; and the declination to the eastward, though less abrupt, is also by steps, or terraces: in that part, however, these occur at longer intervals; but in the neighbourhood of Munchur, five steps, or terraces, rising above each other, are so distinctly marked, that they have the appearance of being artificial. Stupendous escarpments, however, occur in some parts of the Ghàts; perpendicular walls being described as fully 1500 feet high, and others as almost double that height. “Fearful chasms, numerous waterfalls, dense forests, and perennial verdure,” says Colonel Sykes, “complete the majesty and romantic interest of the vicinity of the Ghàts.

To the north and west of the Vindhya range, lies the valley of the Indus, the soil of which is generally sandy, and covered with a saline efflorescence. The district of Sind, which extends on both sides of the River Indus, bears a striking resemblance to Egypt, as well in its natural features as in its climate; both are bounded on one side by a ridge of mountains, and on the other by a desert; and both fertilized by the overflowing of their respective rivers, without which they would be as completely desert as the adjoining regions. The Thurr, or Desert of India, is not, however, utterly destitute of vegetation; for, though in the dry months all verdure totally disappears, the sand-hills after the monsoon are partially covered with grass and jungle shrubs, including an unusually numerous list of plants for a desert tract; “and the *whole of these*, in their berries, leaves, or fruit,” says Sir

Alexander Burnes, "though the spontaneous productions of the soil, are bountifully adapted to the food of man: a fact evincing the wise fitting of the means to the end, in a portion of the globe, where the most scanty crops are gleaned with difficulty from a dusty soil."

To the north-east of the Vindhya range, the alluvial plains of the great valley of the Ganges extend, ascending very gradually from the sea in the Bay of Bengal, to the foot of the Himalayah Mountains. In approaching the base of this range, a close jungle is everywhere found, which, with more or less denseness, extends up these mountains to between four and five thousand feet above the sea, at which elevation tropical shrubs disappear; and from thence to ten thousand feet, the arborescent vegetation is exclusively that of temperate regions; chesnuts, hornbeams, birches, hollies, and oaks. In the same region we meet with abundance of fruit trees, such as apricots, peaches, cherries, pears, apples, and walnuts: besides rich grapes, currants, gooseberries, raspberries, strawberries, berberries, and hazel-nuts in great abundance. The intervening valleys in the same region are, in some parts, absolutely covered with white and yellow jasmine, rose-trees, and gum-cistus, and adorned with singularly beautiful groves of rhododendron, some bearing white, others delicate pink, and others splendid crimson blossoms, attaining the size of forest trees, even at the elevation of 10,000, or 12,000 feet above the sea; beyond which, the rhododendron appears in the guise of a shrub, but disappears at 14,000 feet. The polyanthus grows at 11,000 feet, and has been noticed springing up as fast as the snow melts; buttercups and dandelions have been found at 12,600 feet; and a campanula has been seen in flower at the height of 16,800 feet. The corn grown on these heights, consists chiefly of wheat and barley. The limit of the successful cultivation of wheat is about 10,000 feet above the sea; rye and buck-wheat do not succeed beyond 11,500 feet, but barley is extensively cultivated at the altitude of 13,000 feet, though at that elevation it does not yield more than from three to five-fold. A fine green-sward, admirably adapted for pasture, still occurs, but this ceases at 14,600 feet above the sea; after which the mosses and lichens prevail. The Himalaya moun-

tains rise very suddenly from the low plains of India, but on the northern side they are flanked by the elevated table-land of Tibet. The different height of the snow-line on the northern and southern sides of this range has been before mentioned, and likewise that this variation has been attributed to the radiation and also the reflections of the sun's rays from the elevated plains of Tibet; the snow-line being thus raised to 16,000 feet on that side, whilst on the Indian side it does not exceed 12,500 feet. The line of cultivation varies with the snow-line; and it is a remarkable fact, that precisely as the low plains of India are left behind, and the traveller enters the depths of the mountains, does he find this line more elevated. Thus, on the southern flanks of the Himalaya, cultivation nowhere extends above 6000 feet, but within the first passes, it rises to 7000, within the next, to 8000 feet, though in no part it exceeds from 9000 to 10,000 feet, until we arrive at the northern side, where it extends to 13,000 feet above the sea.

The forests of India are on an extensive scale, and include many plants known only as shrubs in our climate, but which there appear as timber trees; among such may be mentioned the rhododendron, "with blossoms red and bright," of which gun-stocks are made, the privet, and a bramble as thick as a stout man's arm. In these forests we likewise meet with many trees greatly resembling our own, or which are closely allied to British species, and others which have almost become naturalized in Britain; thus, we find the walnut, ash, hornbeam, weeping willow, which in Nepal attains a magnificent size; and a species of oak, the trunk of which sometimes reaches the height of 80 or 100 feet before the branches spread. In the less elevated plains, however, the vegetation assumes a different character, and a vast number of plants occur, peculiar to warm latitudes, and incapable of thriving in temperate climates. Among these, are the teak (fig. 133), the sandal wood (fig. 115), the tree fern of Nepal, 45 feet in height; the rapidly growing bamboo (fig. 210), whose stems or culms, clothed at the top with copious dark green foliage, frequently exceed 100 feet in height, and which literally constitute

forests; the celebrated banyan of India, also, usually called the peepul tree (fig. 93),

Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow
About the mother tree.

These trees are constantly planted near the Hindoo temples. A banyan tree growing on the banks of the Nerbuddah, is described as covering an immense area, the circumference of the space occupied by the parent tree, and its numerous "daughters," exceeding 2000 feet; 320 large trunks have been counted, and the smaller ones exceed 3000, whilst each of these is continually sending forth branches and pendent roots, to form other trunks. It is said that 7000 men have obtained shelter under this very remarkable tree, or group of trees.

But among the grandest features of Indian scenery, the palm trees stand pre-eminent, including the superb palmyra, or flabelliform palm, the fan palm (fig. 174), thorn-leaved palm (fig. 182), the date palm, and the cocoa-nut palm, which latter the Hindoos profess to apply to 365 different uses.

Whilst the high table-lands of India include the trees of temperate zones, and the carrot, turnip, and radish rank among their indigenous productions, in the low districts we meet with the boswellia, which produces gum olibanum; with ginger, nutmeg, and spikenard; sugar-cane, cotton, and indigo (fig. 64), the cashew nut, and the elastic gum vine (*Urceola elastica*), which, as well as some species of fig, affords caoutchouc. The fruit trees also are very numerous, comprising the orange, lemon, lime, shaddock, pomegranate, pine-apple, tamarind, musk-melon, water-melon, guava, fig, mulberry, rose apple, mangosteen (fig. 28), and mango, the latter valuable tree being in fruit, and rarely failing of producing abundant crops in the hot dry season, (occurring in the months of May and June), at which period other vegetables are usually parched up; besides the yet more important plantain (*Musa paradisaica*), whose graceful form is represented in the accompanying cut.

The flowering plants of India are no less varied than its fruits, and are distinguished for their splendour and beauty. Nothing can exceed the richness of the vegetation during the



Plantain—*Musa Paradisaica*.

monsoon. The lakes, and other waters of this region, also abound in many highly curious aquatic plants. Water lilies of various hues are very numerous; and among these, the most remarkable is the *Cyamus nelumbo*, or sacred bean of India, whose splendid flowers, of a full rose colour, are embosomed in leaves of the tenderest green.

Among the animals which more particularly characterize Continental India, may be mentioned the solemn ape, the common Indian monkey, the Asiatic lion, the royal tiger (fig. 13), leopard, panther, cheetah, or hunting leopard (fig. 17), hyæna, wild cat, Indian ichneumon, porcupine, hare, pangolin or manis (fig. 62), called by the natives "the tiled cat," from the scales being arranged like tiles on the roof of a house; the elephant, rhinoceros, wild hog, pigmy hog (which inhabits the Saul forests), nylghau (fig. 94), four-horned antelope, wild sheep, goat, Brahmany bull, with its remarkable hump, which curious appendage, however, this noble animal loses if employed as a beast of burden. We have seen, whilst considering the northern regions of Europe, that the cow and sheep diminish in size in those high latitudes: a similar effect appears to be produced on some others by removal into hot climates uncongenial to their nature; thus, in Central India, the ass, which is unknown in a wild state in this region, but has been tried in a domesticated state, does not exceed a Newfoundland dog in size.

The birds of India are very numerous, and many of them distinguished by the most splendid plumage: an instance of which is afforded by the well-known peacock. The greater number of Indian birds are, however, deficient in song, though a few species have sweet notes, and the lark of India has the same habits and the same lively and delightful song, as the skylark of our own plains.

Teach us, sprite or bird,
What sweet thoughts are thine;
What objects are the fountains
Of thy happy strain?
What fields, or waves, or mountains?
What shapes of sky or plain?

The cuckoo is the identical bird of Europe; and his familiar note may be heard in all the highlands of Central Asia. The common sparrow, and the snipe, are also those of Europe.

The original of our domestic fowl is most abundant in the woods of the Ghâts. Among birds more characteristic of this region, may be mentioned the weaver bird, remarkable for its pendant nest, woven in the most curious and ingenious manner, with fibres of grass; the tailor bird, whose equally curious nest is formed of leaves most skilfully sewed together; and the gigantic crane, or adjutant (fig. 129).

Reptiles are very numerous, including many genera of saurians, among which are crocodiles, garials or gavials (fig. 141), and monitors; and also a great variety of serpents, from the python to the small and beautiful carpet-snake. Some of these species are venomous, especially the deadly Cobra da capello; but the greater number are innoxious.

A remarkable species of land crustacea, called the kenkra, pervades the valleys and table-lands of the Ghâts, burrowing in the earth during the dry season, but during the monsoon covering the ground in such numbers, that travellers ride and drive over them, or trample upon them in the high roads.

India teems with insects, among which we find the coccus laccus, or lac insect; the silk-worm; the destructive white ant, which, however, performs the useful office of nature's scavenger in hot climates; the scorpion, in great numbers; and a very numerous assemblage of splendid butterflies, moths, dragon flies, &c.

The metalliferous minerals are met with only in small quantities in Hindostan, for though gold and silver are found in some parts, they are by no means abundant; iron, however, is extensively diffused. Large deposits of coal occur in some districts, and these appear to belong to the same geological era as the coal formation of Britain. Among precious gems we meet with the diamond, which is found in alluvial soil, and in the beds of some rivers; the ruby, topaz, chrysolite, precious garnet, amethyst, cat's-eye, &c. Carnelian, jasper, and agate, are also very abundant in India.

The islands of Asia, from their position, and the general nature of their productions, have so much affinity with the regions we have now been considering, that it will be desirable to direct our attention to those groups, ere proceeding to consider the northern regions of Asia.

These islands are numerous, and present some remarkable features in physical geography; among which, perhaps, the most striking is the volcanic band, traceable, in a linear direction, through a considerable number of these islands, and to which we shall again have occasion to refer. The other natural features of these islands also present much that is interesting, their productions being rich and varied.

Commencing with Japan, we find the aspect of this region bold and striking: rugged mountains, among which rise its numerous active volcanos, traverse the interior from north to south, but an ample space is covered with the richest valleys and plains. To these islands our gardens are indebted for many highly-prized plants, among which are the hydrangea, pyrus japonica, and aucuba. One of the most remarkable plants of Japan is, however, the cycas revoluta, which is interesting to the geologist, from the resemblance it bears to certain fossil trees belonging to the later systems of the Secondary Period. But perhaps the circumstance of greatest interest attached to the vegetation of the Japanese islands, is the occurrence of some North American plants, of which about thirty species have been observed; these islands thus presenting a union of the vegetation of the Old and the New World. Japan includes among its birds, a splendid peacock, distinct from the Indian species; and two remarkable domestic fowls, singularly differing from each other; the one the crisped cock, having the whole of the feathers curled up so as to appear almost like wool, and the other the silk cock, having the webs of the feathers so entirely disunited, that the bird appears covered with silky hairs; both species are usually white.

Among its mineral deposits, Japan includes gold, silver, cinnabar (the ore of mercury), copper, iron, and coal of excellent quality.

The islands included under the general name of the Indian Archipelago, comprise among their number several of great size; Borneo, indeed, next to Australia, is the largest known island on the surface of the globe, its extreme length from north to south being about 900 miles, and its width about 700 miles. Situated almost immediately under the equator, these islands are exposed to the intensest rays of the sun, but,

surrounded as they are by the waters of the ocean, and varied by lofty mountains in their interior, they enjoy abundance of moisture, and afford an admirable instance of the luxuriant vegetation displayed in equatorial regions, possessing an insular climate. Not only do they yield in abundance all the ordinary products of tropical countries, but contain various highly valuable spices and fruits, peculiar to their own soil, some of which cannot be cultivated with advantage in any other region. These are, however, mostly confined to the south-eastern islands.

Nor are these islands less celebrated for their mineral treasures: for though iron and copper are not so abundant as in some other regions of the globe, the island of Banca is rich in that rare metal, tin; and gold is found in considerable quantities in Sumatra, Celebes, Luzon, and Borneo, especially in the latter island, where it is accompanied by the diamond. Borneo also contains rich deposits of antimony ore; and in the small island of Labuan, lying off the northern coast of this extensive island, coal of good quality has been found.

Forests of extraordinary luxuriance cover a large portion of these islands, often extending from the borders of the sea to the very summits of the mountains, and affording a vast variety of important trees, including numerous graceful palms, superb timber trees, and such as produce ornamental woods, or yield odoriferous gums, and other valuable exudations. To the latter class belong the *ficus elastica* (fig. 95), and the *urceola elastica*, both of which produce the kind of caoutchouc, commonly called Indian rubber; and the gatah, or gutta percha tree (*Icosandra gutta percha*), from which the material known by that name is obtained. The gutta percha is a large tree, with a smooth round trunk, surmounted by a dense crown of rather small dark leaves. When an incision is made in the bark, a considerable quantity of white milky juice exudes, which gradually hardens on exposure to the air, and in this state forms the gutta percha of commerce. It is naturally of a greyish colour, and the reddish hue it frequently assumes, arises from the presence of small particles of the bark. The gutta percha is less elastic than other known kinds of caoutchouc, but, on account of its great

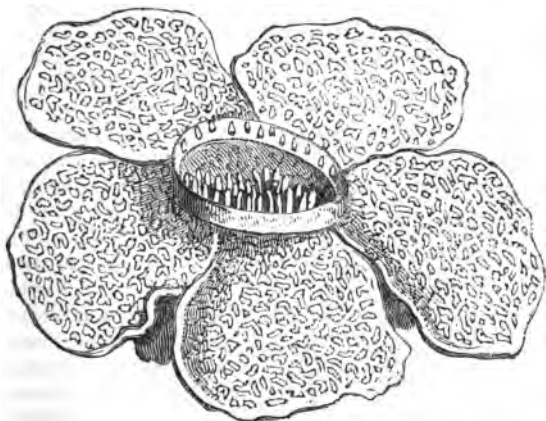
tenacity, and its property of retaining any form into which it may be moulded, it is singularly adapted for various economical and ornamental purposes. It was first met with at Singapore, but the tree also occurs in the forests of Borneo. The camphor tree (fig. 39) is also found in the latter island, and is described by Captain Rodney Mundy as a lofty tree, with very luxuriant foliage. The younger trees yield the camphor in the form of an oil; but in the older trees, it is found in a concrete state, in various parts of the stem and branches. The upas tree also occurs in Borneo, as well as in Java and Celebes, and though modern research has dispelled the illusion which formerly existed concerning the deadly influence of this tree, its sap or juice is highly deleterious, and is used by the inhabitants of Borneo to poison the points of their sumpits or arrows. Their sumpitans, or cases for these poisoned arrows, are usually formed of the casuarina wood, which tree grows abundantly near the shores; where also we meet with the *aquillaria agallocha*, which yields the agila wood, the lignum aloes of commerce; whilst the swampy districts of this island, and of New Guinea, are occupied by the mangrove (fig. 13). Bamboos, and rattans, or canes, (fig. 177), overspread a vast surface of country in Borneo, as well as in other parts of this Archipelago, serving for building, cordage, and other important purposes. Indigo and the sugar-cane are indigenous, the latter being eaten by the natives as an esculent vegetable. The yam is also a native, but is not much prized. Maize is grown, but rice may be considered as the staple food of a large portion of the inhabitants. Among the numerous fruits of these islands are the guava, grape, orange, lime, mango, mangosteen, and durion, the two latter being considered the most delicate fruits produced in any part of the earth, though the durion is said to possess a very forbidding scent. The spice plants, however, form the most peculiar feature in the native productions of these islands. Among these, the clove (fig. 16), a native of the Moluccas, stands foremost, as one of the most precious products of the east. The clove of commerce consists of the unexpanded flower, the corolla constituting the rounded head, and the calyx the tapering portion. The nutmeg tree

(fig. 4), though met with in several of these islands, appears to arrive at the greatest perfection in the group called the Islands of Banda. In its native soil, the nutmeg tree is almost always loaded both with fruit and blossoms; the fruit is red and pulpy, and it is well known that the spice called mace forms a layer between the outer pulpy coat, and the nut, or seed. Mace, when fresh, is of a beautiful crimson colour. Pepper is another produce of these islands, growing in spikes on a climbing plant. Cardamoms, ginger, turmeric, &c. &c., are also met with. The cinnamon tree (fig. 117), grows in several of the islands; but the most esteemed is that obtained from the beautiful island of Ceylon. It is a species of *laurus*, and grows to the height of twenty or thirty feet; the flowers, fruit, and bark, all appearing to partake of the peculiar fragrance of the tree. Among the vegetable treasures of this region, we also find that

Rich with fruits, the tree of Paradise,
The plantain, spreads its large and slender leaves:
And there the pictured palm is seen to rise.

Among the palms occurring in this Archipelago, are the Palmyra palm (fig. 178), the fan palm, cocoa-nut, betel-nut, sago, nibong, or cabbage palm, and the gomuti palm. The pith of the sago palm, when dried, forms a farinaceous powder, of which a single tree will produce 600 or 800 lbs. It constitutes the staple food of some of the islands. The nibong is also a very useful palm. The tufts of young leaves, or fronds, form an excellent vegetable, which may be eaten either raw as a salad, or boiled, in which latter state it is said to resemble sea-kale, and from its having been compared to the tender leaves or heart of a cabbage, this palm has acquired the appellation of the cabbage palm. The beautiful wood of this tree is much used in England for the sticks of umbrellas. The gumati palm, called also the cabo negro, or black head, though its fruit is poisonous, is valuable on account of the kind of coir, or fibre which it yields, and which is employed by the natives of Borneo and other islands, for making cables and cordage of every description. Among the more curious plants of this region, is the *nepenthes*, or pitcher plant, called the monkey cup by the Malays, the sin-

gularly formed leaves of which, usually contain a considerable supply of pure limpid water, there being nearly an ounce of liquid in some of "these beautiful and delicately formed vases," which, observes Mr. Adams, "offer a cool draught to the various animals that frequent the neighbourhood." They grow abundantly in Borneo. Ferns and orchidaceous plants are also very numerous, and among the fantastic forms of the latter tribes, we meet with the rare and beautiful *phælænopsis amabilis*, or Indian butterfly-flower. Perhaps, however, the most remarkable productions of this region are the singular and gigantic parasitical plants, the *Brugmannia zippelii*, the *Rafflesia arnoldi*, and *Rafflesia patma*. The *Rafflesia arnoldi* is a native of Sumatra, and is a plant without stem or leaves, and with roots so minute that they are



Rafflesia Arnoldi.

embedded in the stem of a species of vine, which forms its station, though bearing a flower of the most enormous dimensions, its diameter being three feet six inches, and its weight fifteen pounds. The colour is brick red, inclining to orange, and it emits a highly offensive odour, resembling tainted beef. The species called the *Rafflesia patma* (fig. 212), which measures two feet across, is found in the small island

of Nava Kambangan. It is worthy of notice, that a few plants are met with in this region which indicate its relation to that of Australia, among which the most conspicuous are the eucalyptus, casuarina, and leafless acacia, forms, which are considered as characteristic of Australian vegetation. The same observation may apply to the broad-leaved *cycas* (fig. 149).

In their native animals these islands also display the splendour and variety which, we have before remarked, distinguish intertropical countries. The fauna of this Archipelago, though in most points resembling that of the adjacent continental region, possesses some forms peculiarly its own, whilst others again occur, which, like some of its vegetable productions, remind us of our near approach to Australia, from their affinity to the remarkable fauna of that region. Of this, the tree kangaroo may be mentioned as an instance, which, with some other kindred species, is found in Borneo. Among the animals peculiar to this region are the ourang-outan (fig. 1), and the proboscis monkey. Sir James Brooke has ascertained the existence of three species of ourang-outan in Borneo; and he mentions that these animals build nests, or houses, in the trees, formed of twisted leaves and twigs, resembling rooks' nests in everything but size.* The proboscis monkey, which is distinguished from all others by a long and projecting nose, appears to be confined to Borneo; but the monkey tribes are very numerous in all the larger islands. Bats are also very abundant, including among their number the rousette bats (fig. 8), commonly called vampires. The pteropis, or flying fox, is also very generally diffused, and its kindred species, the galeopithecus, or flying cat, called also the flying squirrel, is much prized in some of the islands for its beautiful skin. The leopard, and some other feline species, are met with in Borneo, and it is supposed that the tiger also exists in that island; several species of the tiger are said to occur in Sumatra, where these animals are very abundant. The cats of the latter island are described as differing from all other modern species, there being one with

* Sir J. Brooke states the remarkable fact, that an ourang-outan which had been wounded, formed a nest for itself, and died there.

a knobbed or twisted tail, and another wholly without a tail. The dogs hunt in packs, and much resemble the *dingo*, or Australian dog. We have already mentioned, that the northern peninsula of the island of Borneo appears to form the eastern limit of the range of the elephant, herds of these animals being reported to inhabit the vast forests in the promontory of Unsang; they are also met with in Sumatra; in which island the two-horned rhinoceros is found, whilst the one-horned rhinoceros occurs in Java, and one species in Borneo. The Malayan tapir (fig. 72) inhabits Borneo and Sumatra; and the babyroussa hog (fig. 76)* is met with in Amboyna and Bouro. Wild swine abound in many of the islands; as do also deer of various species. Among the reptiles of these islands, besides large and formidable crocodiles, and a long list of snakes, including the cobra da capello and the gigantic python, we meet with a great number and variety of lizards, some between five and six feet in length; and with the small, but curious flying lizard of the woods, the painted dragon of the east, which inhabits Borneo and some of the other islands; whilst tortoises abound on the shores, the great supply of tortoise-shell being obtained from this region, especially from the more easterly islands.

The birds of this archipelago are very superb, and comprise among their number the splendid family of the birds of Paradise (fig. 119), which principally inhabit New Guinea and the adjacent islands. The cassowary is a native of New Guinea, and also the beautiful tiger-bittern. The gay plumed lorries and parrots are everywhere abundant; accompanied by doves, or pigeons, adorned with the most beautiful plumage. The argus pheasant ornaments the forests of Sumatra, and a variety of the peacock is found in Java. In the latter island we also meet with the green fruit-eater, which so closely assimilates in colour with the foliage of the trees it frequents, that it is almost undistinguishable, even by a near observer. The curious edible birds'-nests, which are formed by a species of swallow, are found near the sea-

* The two latter animals form the modern representatives of some of the extinct pachydermatous animals of the Eocene era of geology.

shore in these islands, and on the adjacent coasts.* The fish almost vie with the birds in the brilliancy of their colours, and the insects are equally splendid. Many of the latter are conspicuous for size, whilst others exhibit the most singular forms, or the richest colours. Thus, the *megacris Brookei*, a gigantic grasshopper, recently discovered in Borneo, is described as being as large or larger than a sparrow; the *mantis siccifolia*, or walking leaf, resembles a leaf rather than an insect, and the *amphriscus priamus* is one of the most beautiful known insects in any region of the globe.

The Maldiva islands, or Atolls, situated to the westward of the peninsula of India, consist of a vast range of coral isles and reefs, extending for nearly five hundred miles, mostly presenting a similar appearance, that of a tuft of trees in the water: the greater number being covered with cocoa-nut palms, and the highest land in the whole group not exceeding twenty feet above the sea. The only mammiferous animal inhabiting these islands is the flying cat, or flying squirrel (fig. 9), which is very destructive to the cocoa nuts.

CHAPTER XVI.

NORTHERN ASIA.—KUENLUN MOUNTAINS.—ALTAI MOUNTAINS.—URALIANS.—TIBET.—SIBERIA.

Beyond, a frozen continent
Lies dark and wild, beat with perpetual storms
Of whirlwinds and dire hail. MILTON.

HAVING completed our brief sketch of the leading features presented by the rich and varied regions of Southern Asia, we will now turn our attention to the northern districts of that division of the globe.

* The *agal agal*, a species of alga, or sea-weed, enters largely into the composition of these nests, which are esteemed so great a delicacy by the Chinese epicure. The *agal agal* is also much in request among the Chinese, as it forms a pellucid and elastic substance, resembling horn, which they employ in the construction of their lanterns.

Extensive mountain ranges diverge northwards from the Hindoo Koh, the greater part of which run nearly parallel with the grand central line, though at varying distances. The most southerly of these ranges, the Kuenlun, forms the northern boundary of the elevated table-land of Tibet, into which it sends various collateral branches of considerable altitude. The rugged and lofty Belor range, which also diverges from the Hindoo Koh, takes, in its commencement, a northerly course, but in its prolongation in the Mooz-Tagh, or Thian-Chan, extends to the eastward, enclosing the sandy desert of Cobi, or Gobi, until it unites with the mountains of China, to which the elevated Kuenlun also extends. From the same mighty central group of the Hindoo Koh, branches off the vast system of the Altai Mountains, which separate Tartary from Siberia, and which, under the several names of the Sayanskoi, Yablony (or apple), and Aldan Mountains, extend to the shores of the Pacific, near Behring's Straits. These mountains are not generally of very great elevation, though the highest summit, Bieluka, attains the altitude of 11,000 feet above the sea level. A branch from this system extends through the peninsula of Kamtchatka, giving a mountainous character to that territory, which is remarkable for the numerous *sopki*, or volcanos, whose elevated snow-clad summits rise far above the general level of the mountain range.

The Oural, or Uralian mountain range, which forms the separation between Siberia and European Russia, may perhaps be rather considered as a distinct system, than as a branch from the central line, though, in its southern termination, it approaches very near the western extremity of the Altai system. The Uralian Mountains are by no means elevated in their southern portion, but increase in altitude in their northern extension, several peaks rising to the height of 8000 or 9000 feet; though these are not situated in the principal range, but appear like detached peaks. The Uralian Mountains are celebrated for their mineral treasures, which have lately risen into great importance. About the year 1834, extensive beds of sand, containing small particles of gold, were discovered on the Siberian side of this range,

as also, though less abundantly, on its European declivities; and the produce obtained subsequently from this source has been of very great value, having exceeded three millions and a half sterling per annum. It occurs in quartz pebbles and sand, and is mostly found at or near the surface, one enormous specimen weighing 96 lbs. troy, which is now in the Museum at St. Petersburg, having been found loose at the bottom of a gravel pit, lying on the surface of the rock. In the same locality, the huge bones of the mastodon occur, and Sir Roderick Murchison relates, that when the Russian miners first saw them, they exclaimed, "Take all the gold, but leave us the bones of our ancestors—the giants!" On the western, or European side, the sand in some parts contains a considerable proportion of platina, and six platina mines occur; that metal being usually combined with a small quantity of gold. It is a remarkable circumstance, that in beds of sand containing gold or platina, diamonds are frequently found. Baron de Humboldt directed the attention of the Russians to this singular fact, and not long afterwards some of these precious gems were discovered in these beds of auriferous sand, though it appears that the diamonds hitherto found have only been of small size. Iron and other metals also abound in these districts; and Mount Blagodat, situated on the Siberian side of the Uralian range, and which is 1534 feet above the sea, is entirely composed of magnetic iron ore.

The elevated table-land of Tibet, or Tubet, is bounded on the south by the lofty Himalaya Mountains, and on the north by the perhaps little less elevated Kuenlun range. This plateau may be considered as the most elevated plain on the surface of the globe, having, according to Dr. Hooker, an altitude of 15,000 feet above the level of the sea. Its great elevation, in the latitude in which it is situated, might lead us to suppose that it would be destitute of useful vegetation, yet we find that it not only yields excellent pasturage, but in some favourable situations, corn, and even the vine, arrive at great perfection. The peculiarity of climate which renders this vast surface habitable for man, is attributed to the radiating power of the plains themselves, which, as has been before observed,

has also the effect of raising the snow line on this side of the Himalaya Mountains. The circumstance of these plains being screened on the north by the Kuenlun range, may also tend to moderate their temperature.

Among the native vegetable productions of Tibet, are apricots, walnut and apple trees, gooseberries and raspberries, the hazel, rhododendron, willow, oak, deodar pine, oriental fir (fig. 149), juniper, &c.

The animals inhabiting the vast plains of Tibet are numerous and important. The yak or grunting ox (fig. 99), is an animal of great utility, both as a beast of burden, and for the rich and nutritious milk it affords. The tail of this animal consists of a mass of long flowing glossy black hair; and, under the name of *chowrie*, it is in general demand among the chiefs of India, both as an ornament, and as a flap for dispersing insects. Another highly valuable animal is the Tibet goat (fig. 101). The natural habitation of the latter animal is, as we have already seen, among the elevated valleys and snow-clad steeps of the mighty mountain system of this region, and as a protection against the intense cold to which it is exposed, this elegant little goat is provided, in addition to a profusion of black hair, with the under wool which constitutes the beautifully soft material, so greatly prized for the manufacture of the celebrated shawls of Kashmere. The sheep of Tibet, though of small size, are also very valuable animals; and both these and the goats are used as beasts of burden, in crossing the lofty and steep passes of the Himalaya Mountains. The musk deer (fig. 84), from which the perfume of that name is obtained, is very abundant in Tibet.

To the north of the Kuenlun range, lies the desert of Cobi, or Gobi, which presents strong indications of having been at some former era, within the recent period, submerged beneath the waters of the ocean, though it is from 3000 to 4000 feet above the level of the sea, and now forms part of the plains of Mongolia. This district appears to be rich in the finer metals and gems. In one spot, the quantity of gold is so great, that at the period of Mr. Moorcroft's visit to this region, from five hundred to a thousand men were constantly employed in collecting it, on the part of the Emperor of China.

Numerous rich deposits are also supposed to exist in Khoten ; but, if discovered, they are carefully concealed, lest the owners should be compelled to work them for the emperor's benefit ; and thus, by a mistaken policy, these treasures, instead of proving of advantage to the inhabitants, are left buried in the earth. A valuable mine of rubies exists at Akroo, but it is left unworked ; and not long since, a rich vein of silver was accidentally found near Eela, and information of this discovery given to the umban, or resident governor. The latter, having extracted a certain quantity for his own use, caused it to be closed up, forbidding its being further explored. His secret treasure, however, did not escape detection, and he was shortly afterwards poisoned.

Some of the animals of this region are remarkable and interesting. The camel, according to Mr. Moorcroft, is here found wild, and is pursued by hunters as game. Tigers are said to inhabit the mountains of Khoten, which includes among its native quadrupeds, the leopard, wolf, fox, hare, yellow or light-brown bear (fig. 29), &c. Here also we meet with the onager, or wild ass of the desert (fig. 78) ; though perhaps the most remarkable animal of these regions is the Mongolian horse, which inhabits in troops the vast deserts of Central Asia. This animal is light and elegant in its form, and almost inconceivably swift in its motions ; its air is wild and fiery, carrying its head erect, and snuffing up the wind. The tail much resembles that of a cow, having hairs only at the end. It is said that, at the present day, all attempts at taming this singular animal have proved unsuccessful, though it appears to have been domesticated in ancient Greece.

The vegetation of the less elevated portion of this region much resembles that of Southern Europe, the vines being very productive, and wheat, barley, and maize being cultivated ; there are, however, few trees of value for timber ; scarcely any being met with, except mulberry trees, and some poplars and willows.

The Beloor range of mountains separates the table-lands of Tibet and Mongolia from the plains of Turkistan, which, including Bokhara and Kokaun, stretch from thence to the Caspian Sea, gradually declining in elevation as they approach its

shores and those of the lakes of Zaizang and Aral; forming a series of terraces, terminating in the saline steppes in the neighbourhood of the latter lake, which are below the level of the ocean. A large portion of this territory consists of a desert tract, composed partly of hard clay, and partly of plains and hillocks of sand, in some places, however, overgrown with brushwood, and covered with scanty herbage. The greater part of this district is arid; but the flat country bordering on the river Volga is very swampy. The portion of this region which is watered by the River Oxus has a much more varied surface, and accordingly, differs greatly in character from the unprofitable territories just described; not only being fertile and productive, but celebrated for its romantic glens, choice fruits, and abundance of nightingales.

Gold is found in considerable quantities on the banks of the Oxus; and, in the same district, lapis lazuli, and very fine rubies, occur.

The Caspian Sea abounds in water-fowl and fish; among the latter is the sturgeon (fig. 155). The most esteemed caviare is formed of the roe of the sterlet, a smaller species of sturgeon, also inhabiting this inland sea.

Nearly the whole of Northern Asia is occupied by the vast Lowland of Siberia, which commences at the foot of the Uralian Mountains, and extends almost to the shores of the Pacific. This extensive plain, skirted on the south and east by the Altai Mountains, and their eastern prolongation, and exposed, without any sheltering highland, to the cold northern blasts, experiences a very severe climate, and presents one immense and dreary level, not more than one-third of which is supposed to be capable of cultivation. Throughout nearly the whole of the northern tracts, the earth is bound in perpetual frost; and even the broad level belt which stretches across the southern parts consists of little else than marshy and salt steppes, yielding only saline plants, unfit for the sustenance of man. Some of the southern districts bordering on the rivers are, however, covered with luxuriant pastures, and, when cultivated, yield unusually abundant crops.

The whole of Siberia appears to teem with metals of

various kinds ; and though the existence of the stores of gold occurring at the base of the Ural Mountains had remained for centuries unknown to its modern possessors, this country has been celebrated from a remote period for its mineral treasures. Indeed, as M. de Humboldt has well suggested, it appears more than probable that the account, hitherto almost considered fabulous, given by Herodotus of the ancient Scythians bringing large lumps of gold from the wild Arimaspes and Essedones and their griffins, in fact alluded to the inhabitants of the hyperborean regions of Siberia, who doubtless may have obtained these mineral treasures from the same districts still so prolific in the precious metal. And we may add that this conjecture seems to be confirmed by the fact, that ancient mines have been discovered in the neighbourhood of Krasnojask (which place has *recently* risen into a thriving mining city), these mines having been wrought at some former period, of which there is no account or tradition. The instruments used in the mining operations have been found, and these are of forms and materials indicating great antiquity, including huge hammers, made of stone, and instruments resembling pickaxes and wedges, made of copper. The props which supported the earth are said to be mineralized. The Altai range is no less famed for its metallic treasures than the Ural, gold being found in considerable abundance in the detritus on the flanks of these mountains, and silver occurring in vast quantities, the mines of the latter metal being in some parts so numerous, that "the whole district may be said to be silver;" whilst in others, on the removal of the slate covering, an almost unbroken mass is found of ores of gold, silver, and copper. The stores of iron also seem inexhaustible. Coal is said to be worked in Siberia ; and rock-salt is abundant. Among the precious stones of this region are the diamond, emerald, topaz, chrysolite, beryl, onyx, and garnet. Lapis lazuli and malachite also occur ; and a remarkable and useful product is afforded by the mines of talc, which mineral is used as a substitute for glass, in the whole of Asiatic, and in part of European Russia.

The vegetation of Siberia bears a general resemblance to that of Northern Europe ; though the scarcity of *hard wood*





White Birch.—*Betula Alba*.

trees, such as the oak, beech, &c., forms a striking feature in this region. The birch may be considered as the preponderating tree of this class, and of this we meet with several species. Willows are likewise very numerous, both in some of the steppes, and occurring among the plants approaching the last limits of vegetable life, in the cold and more elevated districts. Siberia also numbers among its trees the Siberian crab (fig. 59), the poplar (fig. 112), which is found on the banks of the rivers; and the aspen (fig. 113). On the declivities of the Altai mountains grow the Siberian pine (fig. 142), Siberian silver fir (fig. 148), Siberian cedar (fig. 154), larch (fig. 156), and juniper (fig. 162).

The peninsula of Kamtchatka might, from the parallel of latitude in which it is situated, be expected to possess a climate similar to that of Great Britain; but, placed on the eastern side of the continent, and deprived of the various conditions which temper the climate of our favoured island, and also of Western Europe generally, and being at the same time traversed from north to south by a range of snow-clad mountains, it possesses an arctic climate, scarcely enjoying three months' exemption from frost; and all attempts to raise the hardiest species of grain have proved unsuccessful. Berries of various kinds, however, and some roots, afford a supply of vegetable aliment.

The deficiency of vegetable food in Kamtchatka, and in Northern Asia generally, is, however, in some degree compensated by the abundant provision of animal food afforded by the vast numbers of land animals, as well as marine mammalia, and the countless flocks of grouse, woodcocks, wild geese, and ducks, which frequent this region. The valuable reindeer is found in every part of Siberia, but more especially on the bleak shores of the Northern Ocean. The elk is also an inhabitant of this region; where we likewise meet with the arctic fox (fig. 25), and polar bear (fig. 27). The most characteristic feature in the zoology of this region is, however, the abundance of the smaller fur-bearing animals, such as the ermine (fig. 35), sable (fig. 36), &c.; these territories, which, from their chilly climate, are incapable of nourishing most of the valuable productions of more genial climates, being thus

amply stocked with suitable inhabitants, protected from severe cold, either by the richest and softest, as well as most beautiful furs, or by an internal defence of fat or some other unctuous substance. The skin of the ermine, found on the banks of the rivers Witim and Olekma, is esteemed the finest in the world. That curious little animal, the economic mouse, is an inhabitant of Siberia. Endowed with the most extraordinary instinct, this little creature burrows in soft turfy ground, in which it deposits its stores in summer, thus providing an ample supply for its wants during the long and rigorous winter of its native country. Among the domesticated animals, the Siberian dog holds an important place, being much employed, both in Kamtchatka, and in various parts of Siberia, for drawing sledges over the dreary and snow-covered surface.

CHAPTER XVII.

VOLCANIC REGION FROM THE ALEUTIAN ISLANDS TO THE
MOLUCCAS.—VOLCANIC LINE FROM FORMOSA TO THE
CASPIAN.—VOLCANIC REGION FROM THE CASPIAN TO
THE AZORES.—ICELANDIC VOLCANIC REGION.

Where the slumbering earthquake
Lies pillowed on fire;
And the lakes of bitumen
Rise boilingly higher.

BYRON.

HAVING now come to a termination of our rapid travels over the surface of the vast territories of Europe and Asia, let us, ere directing our attention to Africa, consider some of the most striking evidences of the present energy of subterranean heat, in the regions we have visited; confining ourselves (with very few exceptions) to notices of volcanic eruptions, and convulsions of the earth, recorded as having occurred within the last hundred years.

The portion of the globe we have already traversed, besides other indications of volcanic action, includes two of the marked

volcanic bands; that from the Aleutian isles to the Moluccas, and that from the Caspian to the Azores, and also the Icelandic volcanic regions.

The volcanic region from the Aleutian Isles to the Moluccas claims our first attention. This may be considered as connected with the volcanos in the peninsula of Alyaska, to which we shall have occasion to recur, when our attention is directed to the American volcanic region. In our present line, the volcanic band extends at first in a westerly direction for about two hundred geographical miles;* it is then prolonged southward without interruption, through a space of sixty or seventy degrees of latitude, to the Moluccas, where it branches off in different directions.

In the Aleutian Archipelago, almost every island appears to be volcanic, and earthquakes of the most terrific description continually agitate and alter the surface of the land, and also the bed of the ocean. A new island, four miles in circumference, and the summit of which is said to be 3000 feet in height, rose *at once* from the sea, in the year 1806. Another new island of considerable size, having a peak of equal elevation, was formed in 1814.

The volcanic line is continued in the peninsula of Kamtchatka, which is subject to severe earthquakes, and which contains no less than thirteen volcanic peaks. Seven of these volcanos, or sopki, are in a state of activity; and they are mostly of great elevation, their isolated and conical forms towering proudly above the rugged mountain range, which traverses the peninsula. The peak of Klutchefskaia is 15,825 feet above the sea.

The Kurile Islands constitute the next continuation of the volcanic band, there being a train of volcanic mountains in these islands, nine of which are known to have been recently in a state of activity. Earthquakes have also at various periods convulsed and altered the whole area.

From hence the volcanic line is prolonged in the Japanese group. The island of Yesso, or Jesso, contains some active volcanos; and in Nipon, or Nifon, the number is very consi-

* Nearly 280 British statute miles.

derable. Slight earthquakes also are almost incessant, and violent convulsions are experienced at distant intervals. Such was the tremendous earthquake which occurred in August, 1783, and which was accompanied by a volcanic eruption.

Between the Japanese and Philippine Islands, the volcanic chain is continued, being displayed in several small insular volcanic vents. Sulphur island, in the Loo Choo Archipelago, contains a sulphuric volcano, which emits white smoke accompanied with a strong smell of sulphur. The island of Formosa is volcanic, and suffers greatly from earthquakes; and there is an active volcano in the Bashee Islands, which was in eruption in January, 1838.

Luzon, the largest of the Philippines, contains three active volcanos; and a severe earthquake occurred at Manilla in 1833. A volcano in the island of Mindanao was in violent eruption in 1764.

The volcanic band is next prolonged through Sanguir and the north-eastern extremity of Celebes, to the Moluccas, by

. The isles
Of Ternate and Tidore, whence merchants bring
Their spicy drugs.

A violent eruption took place in the great volcano of Ternate in March, 1839, the consequence of which has been the almost entire desolation of this once fertile island. A similar fate, though of less recent occurrence, befel the small island of Sorea, one of the Moluccas, which, though formerly habitable, now consists of one great volcano.

The volcanic region at this point becomes more widely extended, being continued in one direction through Celebes and Borneo; and in another, through Banda, New Guinea, and New Britain, to various parts of the Polynesian Archipelago. The *linear* volcanic band, however, whose course we have followed from the Aleutian Isles, may be regarded as more especially prolonged in a third direction, which consists of a chain of elevated volcanos passing through the islands of Sumbawa, Java, and Sumatra, to Barren Island, one of the Andaman group, in the Bay of Bengal, where it terminates.

One of the most violent eruptions on record in history, occurred in April, 1815, in the volcano of Tomboro, in the

island of Sumbawa. A violent whirlwind preceded the eruption, carrying up houses, trees, cattle, and even men, into the air, and sweeping everything before it. Great tracts of land were covered with lava, and the fall of ashes and volcanic dust was so prodigious, that at Java, three hundred miles distant, the obscurity in the day time is said to have been most profound, so that nothing equal to it was ever witnessed in the darkest night. The earthquakes accompanying this eruption, extended one thousand miles in every direction, and the explosions are said to have been distinctly heard in Sumatra, at the distance of one thousand miles in a direct line. The floating ashes and scorix, for some days formed a mass two feet in thickness on the surface of the ocean, which greatly impeded the navigation among those islands. A subsidence of eighteen feet took place on the western coast of the island; and thus, the sea remained permanently at the depth of eighteen feet, on places previously occupied by dry land. Out of a population of twelve thousand, only twenty-six survived on the island.

Java contains thirty-eight large volcanic mountains, many of which continually emit smoke and sulphureous vapours; and tremendous eruptions and violent earthquakes have at various periods occurred in this island. One of the most remarkable was the eruption of Papandayang, in 1772. This volcano, previous to that period, had an elevation of 9000 feet; but during this eruption the ground gave way, and a considerable part of the volcano disappeared, the height of the cone being reduced to about 5000 feet. An area of ground, fifteen miles long and full six in breadth, was thus wholly swallowed up in the bowels of the earth. The volcano of Ganteer, near Batavia, burst forth in fearful eruption on the 22nd of May, 1840. The result of this eruption, which lasted for several successive days, has been a vast enlargement of the crater, whilst the mountain, which was previously clothed half way up its sides with vegetation, has been converted into one mass of arid and blackened rock and scorix.

It has been made a subject of question by Baron de Humboldt, whether a volcanic band, though in a lesser degree of activity, but which may be considered as forming a continuous

line with the volcanic region extending from the Caspian to the Azores, may not exist in the line of the mighty mountain range which we have been tracing across the centre of Asia. A large portion of this part of Asia is still unknown to European travellers; but the observations of those who have recently visited some of those territories, tend to confirm this opinion. When compared with the energetic volcanic band, whose course we have been following, we shall perhaps find little in this region to engage our attention: indications of active subterranean heat are not, however, wanting; and the fact of its occurrence *in the line* of this mighty mountain range, at once attaches a high degree of interest to its consideration. This volcanic band is regarded as commencing with the volcanic island of Formosa, where, as already mentioned, earthquakes are frequent. It next enters the Chinese territory.

No active volcanos are known to exist in China proper, but a vast volcanic district occurs in Mongolia (said to occupy a surface of 7000 square miles), which contains several extinct volcanos, and some in a state of activity. The most remarkable volcanos of this region appear to be situated in the line of the Mooz-tag, or Thian Chan Mountains, which seemingly connect the mountains of China with the Hindoo Koh. Among these volcanic mountains the most conspicuous are Pechan and Hotcheou.*

But although China may not contain any active volcanos, that country is, and has for ages, been subject to violent earthquakes. One of the most severe on record occurred in the fourteenth century, commencing in 1333, and lasting for ten years; this terrible convulsion being attended with a vast destruction of life and property, and with many changes in the surface of the country. This severe disturbance of the earth's crust has been supposed to have extended westwards in the line we are now attempting to trace.† Accounts of the intermediate regions have not been handed down to us; but

* Volcanic vents are usually met with comparatively near the sea; and the occurrence of these volcanos, at the distance of from 900 to 1200 miles from the sea may be noticed as a remarkable circumstance.

† See *Treatise on Physical Geography*, by Professor TRAILL.

Asia Minor and Egypt were violently convulsed in 1346, and in the following year, earthquakes were experienced in Cyprus, Greece, and Italy, as well as over a great part of Europe, thirty villages being said to have been totally destroyed in Carinthia; and these agitations of the earth continued to recur at intervals in Germany, France, Silesia, Poland, England, and other parts of Europe, until the year 1360. China is, to the present day, subject to these visitations; an earthquake of considerable severity having occurred on the 24th of June, 1830, at Tayming, situated to the north of Houan.

Gaseous exhalations, also, are common in China; and there are some of these natural vents in that country which have been burning for centuries, and which are turned to economical account. Thus, in the neighbourhood of Tchelicoutcheou, the salt works were formerly heated and lighted by means of these fountains of fire; bamboo pipes being employed, to conduct the gas from the spring to the place where it was intended to be consumed. These bamboo pipes are terminated by short tubes of pipe-clay, to prevent their taking fire. A single well is sufficient to heat more than three hundred kettles. The fire thus obtained is said to be so exceedingly brisk, that the caldrons are rendered useless in a few months. Other bamboos conduct the gas which is used for lighting the streets, and the apartments, or kitchens. Thus, nature presents in this place a complete establishment of gas-light; and it appears that we must yield to the Chinese the palm of having been the first to apply gas to the economical purpose of lighting up houses and streets.

The line of mountains which connects China with the Himalaya range is too little known for any certain conclusions to be arrived at respecting its nature; and the Himalaya range itself appears to present but little indication of volcanic agency, though hot springs occur, some being of very high temperature; and earthquakes appear to have rent and shattered some of these rocks. If, however, we pursue our course to the southward of this range, more decided indications of active subterranean heat present themselves. Thus, on the eastern bank of the Irawaddi, we meet with vast springs of petroleum. These wells, which have long been celebrated, are three

hundred in number, and the pits are from 200 to 250 feet deep. The supply they afford is immense. Earthquakes also occur in this region; thus, on the 23rd of March, 1839, a dreadful earthquake visited Ava. The bamboo and lighter buildings escaped, but in Ameerapoora, and the surrounding districts, all the brick buildings were thrown down, burying in the ruins several hundreds of the inhabitants. The earth was in many places rent into wide chasms, from whence issued torrents of water and gray mud, which emitted a strong sulphureous smell.

Bengal, again, we find to be subject to these dreadful visitations. In the year 1762, Chittagong was violently shaken by an earthquake, attended with many fearful phenomena, and much loss of life. This convulsion extended to Calcutta; and it is said that two volcanos burst out in the Secta Cunda Hills.

Earthquakes are by no means unfrequent in Hindostan; and although no volcanos are known to exist in Central India, the buried cities in that region seem to indicate, that some very violent eruption must have occurred within the historical period. The city of Oujein was, about fifty years before the Christian era, the seat of empire, art, and learning. But, according to tradition, this city, together with more than eighty other large towns in the province of Malwa and Bagur, was, in the time of the Rajah Vicramaditya, overwhelmed by "a shower of earth which fell from heaven." "That this was produced by a volcanic eruption," says Mr. Lyell, "appears very probable, although no information has been obtained respecting the site of the vent; and the nearest volcano of which we read, is that which was in eruption during the Cutch earthquake in 1819—at least 300 geographical miles* from Oujein." The soil in which Oujein is buried is described as being of an ash-gray colour, with minute specks of black sand. On digging to the depth of about fifteen feet, brick walls, pillars of stone, utensils of various kinds, and ancient coins, are found. A large quantity of wheat was discovered, almost entirely consumed, and in a state resembling charcoal.

* About 348 British statute miles.

According to tradition, the course of the river Sipparah was changed at the same period.

A very severe earthquake occurred at Cutch on the 16th of June, 1819. The principal town, Bhooj, was converted into a heap of ruins, and the shock was very destructive at some other places. At Ahmedabad, the great mosque, erected by the Sultan Ahmed, fell to the ground; and the earthquake extended to Poonah, 400 miles distant. The shocks continued for four days, when the volcano Denodur, situated thirty miles north-west from Bhooj, is said to have burst forth in eruption, and the convulsions ceased.

This earthquake produced great and important changes in the delta of the Indus. The eastern channel of that river was, before this convulsion, fordable at Luckput, being only about a foot deep at low water; but after the shock, it was deepened to more than eighteen feet. And thus, this branch of the Indus, which had been closed for centuries, again became navigable. A depression or subsidence of land took place at the village and fort of Sindree; the sea rushed in, and in a few hours converted a tract of land, 2000 square miles in area, into an inland sea, or lagoon. It is remarkable that neither the movement of the earthquake, nor the rushing in of the water, entirely threw down the small fort of Sindree; one of the towers remaining almost uninjured; and the day after the earthquake, the inhabitants who had retreated thither, were enabled to effect their escape in boats. A tract of land, fifty miles in length, and in some parts sixteen in width, was at the same time elevated about ten feet above the plain. To this uplifted tract the inhabitants, to distinguish it from artificial mounds, gave the name of Ullah Bund, or the Mound of God. In 1828, Sir Alexander Burnes visited this spot, and went in a boat to the ruins of Sindree, where a single remaining tower was seen in the midst of a wide lagoon, the top of the wall still rising two or three feet above the level of the water. From this spot nothing was visible but an expanse of water, except in one direction, where a blue streak of land indicated the presence of the Ullah Bund. "This scene," observes Mr. Lyell, "presents to the mind a lively picture of the revolutions now in progress on the earth—a

waste of waters where a few years before all was land; and the only land visible, consisting of ground uplifted by an earthquake."

The province of Kumaon, in Northern Hindostan, is so subject to earthquakes, that the houses in Almorah, its chief city, are constructed on a particular plan to guard them from the impending danger, the lower stories being formed of stone, with a superstructure of wood. An earthquake of considerable violence was experienced at Lahore, in September, 1827. In the month of June, 1841, again, a severe earthquake occurred near Baban, by which houses and [fortresses were levelled with the ground, and large masses rent from the adjacent mountains; the latter, falling into the bed of the River Attock, obstructed the course of the stream, thus causing a calamitous inundation, by which several of the natives perished. It therefore appears that the region of earthquakes and volcanos traverses the whole of Hindostan; but to what extent it may be continued in the countries to the westward is uncertain, some parts of those territories still remaining as blanks on our maps.

We also find that the valley of the Oxus is subject to these convulsions; and a short time previous to Sir A. Burnes' visit to that district, the whole basin of the river had been shaken by a tremendous earthquake, which destroyed several towns, and obstructed the course of rivers.

We now arrive at the Elburj range of mountains, where we meet with the elevated volcanic cone of Mount Demavend. The whole country in the vicinity of this mountain bears strong indications of violent volcanic action; strata of rocks being contorted and twisted about in all directions, and hot springs being very frequent in the surrounding districts. The mountain itself, although now externally extinct, still retains most decided evidence of internal heat. Its summit is formed of soft rock, in which is imbedded a remarkable deposit of pure sulphur, supposed to be of very recent formation. In the interior of the caves, or recesses, from whence this sulphur is dug (which is effected with the assistance merely of a piece of stick), the temperature is described by Mr. T. Thomson, who visited the spot in September, 1837, as

being so high, that his hand would not bear exposure to the hot current of air which flowed from the interior of the rock.

We have now arrived at the volcanic region which occupies the country round the Caspian Sea; and again enter into one of the more marked volcanic bands—the volcanic region from the Caspian to the Azores.

The volcanic region from the Caspian to the Azores extends from east to west for the distance of about 1000 geographical miles,* and from north to south from about the thirtieth to the forty-second degree of north latitude, including within its limits the Mediterranean Sea and its most prominent peninsulas. Its northern boundaries are the Caucasus, the Black Sea, the mountains of Thrace, Transylvania, and Hungary; the Austrian, Tyrolese, and Swiss Alps; the Cevennes and Pyrenees. The southern boundaries of the region include the countries bordering on the Tigris and Euphrates, Palestine, and part of Arabia, the most northern parts of Africa, and the Canary Islands. Throughout the whole area comprehended within these extensive limits, we may trace numerous points of volcanic eruption, hot springs, gaseous emanations, fountains of petroleum, and other signs of igneous agency; whilst few tracts of any extent in this region, have been entirely exempt from earthquakes within the last three thousand years.

The country between the Caspian and Black Seas exhibits very marked indications of energetic subterranean heat. In this region, near Baku, in Azerbaijan, is situated the remarkable tract, called the Field of Fire. This consists of a hollow expanse, full of fissures from which an inflammable gas continually issues, producing a blue flame. This was the native land of Zoroaster, and, in ancient times, formed one of the most celebrated "Shrines of Grace," among the Ghebers, or fire-worshippers, who erected their temples over these natural springs of fire. In the same district, numerous mad volcanos occur; and volcanic eruptions have taken place in the years 1830 and 1840. The latter eruption, which occurred on the 7th of February, commenced about midnight, and was accompanied by a loud subterranean noise, which was heard at the

* About 1150 British statute miles.

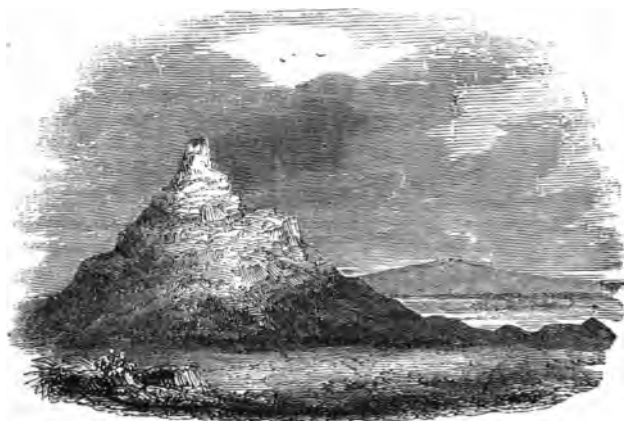
distance of twenty miles. Numerous fissures were formed, and lava thrown up, whilst the flames which issued from the ground were visible at the distance of twenty-five miles from the spot. A dense black smoke, which rose like an immense column, was driven like a thunder-cloud before the wind, depositing in its course a great number of small globules, resembling shot, composed of the burnt matter and sulphur. The ground was violently agitated during the whole of the succeeding day, and the atmosphere, to a considerable distance round, was impregnated with sulphur. In this district, we also meet with inexhaustible springs of naphtha, which yield daily 1000 pounds' weight; and no sooner are the wells, or pits, emptied, than they are instantly replenished. As this mineral oil, from its lightness, floats upon water and will burn freely on its surface, the inhabitants on the borders of the Caspian frequently in calm weather form a splendid exhibition, by pouring whole tons of it into that sea; being then set on fire, and borne upon the surface of the waves, it presents the appearance of a sea of flames.

The countries bordering on the Euphrates and Tigris are equally abundant in naphtha, as well as in the different varieties of the same substance, asphaltum, petroleum, and bitumen. This territory includes the ancient "plain in the land of Shinar;"

The plain wherein a black bituminous gurge
Boils out from underground, the mouth of hell,
Of brick, and of that stuff, they cast to build
A city and a tower, whose top may reach to heaven.

In this plain, about six miles from the site of ancient Babylon, Mr. Rich mentions that a vast heap of ruins is still to be seen, supposed to be the remains of the Tower of Babel. On the summit is a solid pile of brickwork, much shattered, and rent by a large fissure. Around the pile lie huge fragments of brickwork, confusedly heaped together, and converted into solid vitrified masses, as though they had been exposed to the action of intense heat. This heap of ruins is known by the name of the Birs Nimrood.

"The never-failing fountains of bitumen, famed of old, and situated near the ancient and celebrated city of Hit, which



Birs Nimrood.

were visited by Alexander the Great, and at a later period by the Emperor Trajan, still continue, as they did in those days," says Colonel Chesney, "to be employed as pitch to cover the gopher boats of the Euphrates, and the asphaltic coracles of the Tigris."

Every part of this region, from the borders of the Euphrates to the Caspian, and from thence to the Black Sea, is very subject to earthquakes. The same remark applies to the Caucasian district, which also abounds in hot springs and in mineral waters. The whole country round Ararat rests, as we have seen, on a basaltic base, and both that mountain and Sevellan have long been considered as the cones of extinct volcanos; and the recent terrible convulsion, which has shaken Mount Ararat, proves that subterranean heat still continues in great energy in this region. On the 2nd of July, 1840, the shock of an earthquake, which lasted for one minute, was felt in Armenia; being particularly violent in the districts of Scharour and Sourmala, where all the villages were destroyed. Vast masses of earth, stones, and ice, were precipitated from Mount Ararat, beneath which the village of Akhoura, with all its inhabitants, was totally buried. Torrents of melted snow

also poured down from the mountain, devastating the fields and orchards to the distance of seven miles. Slight shocks continued to be felt in the environs of Ararat until the 8th of July, the severest recurrence of these convulsions having been on the 6th, when immense masses of rock were again detached from Mount Ararat, and a vast torrent of melted snow poured from the mountain, which, rushing down with extraordinary rapidity, destroyed in two minutes everything in its way, so that there remained no trace of the previously flourishing fields and orchards, for the distance of nearly fourteen miles. Mud volcanoes occur in this region, and in 1817, an eruption of this description took place, when, in the course of eighteen days, a mass of mud, 868 feet in height, was formed.

.. In the Sea of Aras, again, volcanic eruptions have occurred within a recent period; a submarine eruption, accompanied by loud detonations, emission of fire and smoke, and the throwing up of stones, having taken place in 1799, and a new island having been formed in the same locality by volcanic eruptions in the year 1814.

Syria and Palestine abound in volcanic appearances. Between the River Jordan and Damascus lies a volcanic tract, which is described as composed of nothing but lava and other volcanic products; small craters and fearful fissures are also numerous; and travellers declare that there are evident signs of the whole country having been formerly filled with volcanoes. The whole region round Lake Asphaltites, or the Dead Sea, likewise bears the strongest indications of volcanic action. Very extensive areas of this region have also, at various periods, been convulsed by earthquakes, attended with great destruction of cities and loss of life. Continual mention is made in history of the ravages committed by earthquakes in Tyre, Sidon, Berytus, and other places. An earthquake is mentioned by the prophet Amos as occurring in Judea in the time of Uzziah, B.C. 791; another is mentioned by Josephus as having happened during the reign of Herod the Great, B.C. 31. And, within a very recent period, violent convulsions have agitated the whole region. Thus, in 1822, Aleppo was almost destroyed by an earthquake, the effects of which were felt from Diarbekr

to the island of Cyprus. Another great convulsion took place on the 1st of January, 1837, which extended 500 miles in length and 90 in breadth, and totally destroyed Tiberias, and laid many other towns and villages in ruins. It was observed that, after this earthquake, the temperature of some springs in this territory was greatly augmented.

In Asia Minor we again meet with marked indications of volcanic agency; volcanic cones occurring in various parts, and hot springs being very numerous. Among the former is the extinct crater of Mount Argæus, which rises up abruptly from a broad extended base almost to a single peak, 13,000 feet above the sea. Perhaps, however, the traces of igneous action most remarkable, on account of their classical interest, are three extinct craters, situated in a tract called by the Greeks, *Katakakumene*, or the *Burnt Region*, and which correspond to some volcanic vents described by Strabo as "three pits, which are called bellows." This tract, which consists of a large territory with an arid and cindery soil, is situated in the south-western part of Asia Minor. The whole of this region is also subject to earthquakes. Thus, in September, 1754, a severe convulsion agitated nearly the whole of Asia Minor, having been felt simultaneously at Sivas on the borders of Armenia, and at Constantinople. The former city was engulfed, and a lake formed on its site. It was also felt at Angora, and very severely in Nicomedia; and, though more slightly, along the whole southern coast, and at Smyrna. It extended to Constantinople, and even to Alexandria and Kairo, or Cairo, in Egypt; proving exceedingly destructive at the latter place, where it threw down many buildings, burying great numbers in their ruins.

We next arrive at the Grecian Archipelago, where the island of Santorini forms the grand centre of volcanic action, and where, at various periods, new volcanic islands have risen from the sea. The island of Milo also contains a volcano of recent aspect, having a very active solfatara in its crater, and many sources of boiling water. These islands are also subject to earthquakes. In March, 1755, Mytilene was visited by a very severe convulsion, by which two thousand houses are said to have been thrown down, and great numbers of the inhabitants killed.

Many severe earthquakes are on record in the Morea,—Sparta having been laid in ruins by one of these convulsions in the year B.C. 469. In more recent times, we find that in July, 1754, the coast of the Morea was visited by a severe earthquake, when several populous villages near Lepanto were swallowed up. A severe earthquake also occurred in the island of Cerigo in 1754.

The Ionian Isles are almost continually convulsed: in the year 1820, after a severe earthquake, a new rocky island made its appearance near Santa Maura; and on the 31st of October, 1841, a violent earthquake occurred at Zante, which was attended with disastrous consequences, destroying the castle and town, depriving many persons of life, and causing the disappearance of a small island in the harbour.

We have already alluded to an earthquake which was experienced at Constantinople, in September, 1754, at which place it was very severe, and did much injury to the city and the suburbs. Tracing our course from thence, through Macedonia, Thrace, and Epirus, we find that these territories have always been subject to earthquakes; and in October, 1837, a convulsion of sufficient severity to throw down several houses, and by which many lives were lost, was felt at Agram, and throughout the whole of Croatia. Istria, again, is subject to these disturbances; and in the year 1751, three parts of the city of Fiume were swallowed up by an earthquake; and a little island off the coast, with all its inhabitants, totally disappeared, not a vestige being visible on the following day.

The latter districts, however, are situated rather to the northward of the marked volcanic band, and yet more so is the town of Bonneville, near which a remarkable convulsion occurred in July, 1751. A sudden subsidence took place in the mountain of Plainejou, large masses of rock being at the same time precipitated into the adjoining valley. The mountain itself was observed to be covered with cinders and ashes; and from two vents, about a quarter of a mile apart, thick columns of smoke issued, emitting a strong sulphureous smell, occasionally accompanied by flame.

The energetic volcanic action displayed in Southern Italy, Sicily, and the Lipari Isles, is well known. The volcanic district of Italy extends from Cape Campanello to the River

Ombrone, south of the Bay of Naples; but, excepting near its southern extremity, external volcanic action has long been extinct. Volcanic products and gaseous exhalations, however, occur in various parts. Among the latter are the Grotto del Cane, and the Lago Amsanto. The Alban Lake occupies the crater of an extinct volcano; and the circular cavity called Hannibal's Camp, situated amid the Alban hills, also consists of an extinct crater, which presents indications of more recent volcanic action, than any of the other cones in this immediate locality. The

Seven Roman hills, the world's seven wonderments, are also of similar composition.

The district of active volcanos extends from Vesuvius, through the Phlegrean fields, to the islands of Procida and Ischia. Within this space, the volcanic energy is sometimes developed in smaller eruptions from a considerable number of scattered points, though the greater part of its action has been confined to one principal vent, Vesuvius, or Somma. Before the Christian era, this principal vent appears to have been in a state of inactivity; but terrific eruptions took place in the islands of Ischia and Procida. In Ischia there are no less than twelve considerable volcanic cones, which have been thrown up since the island was raised above the surface of the deep.

The ancient cone of Vesuvius is described as having been of very regular form, terminating with a flattish summit, where might be seen the remains of an ancient crater, nearly filled up, but leaving in its interior a slight depression, which was covered with vines, having an arid plain, however, at the bottom. The exterior flanks of the mountain were clothed with fertile fields, richly cultivated; and at its base were the populous cities of Herculaneum and Pompeii. But this scene of repose and fertility was doomed to cease. After a series of earthquakes, which lasted for sixteen years, the volcano burst forth in a most tremendous eruption in August, A.D. 79.*

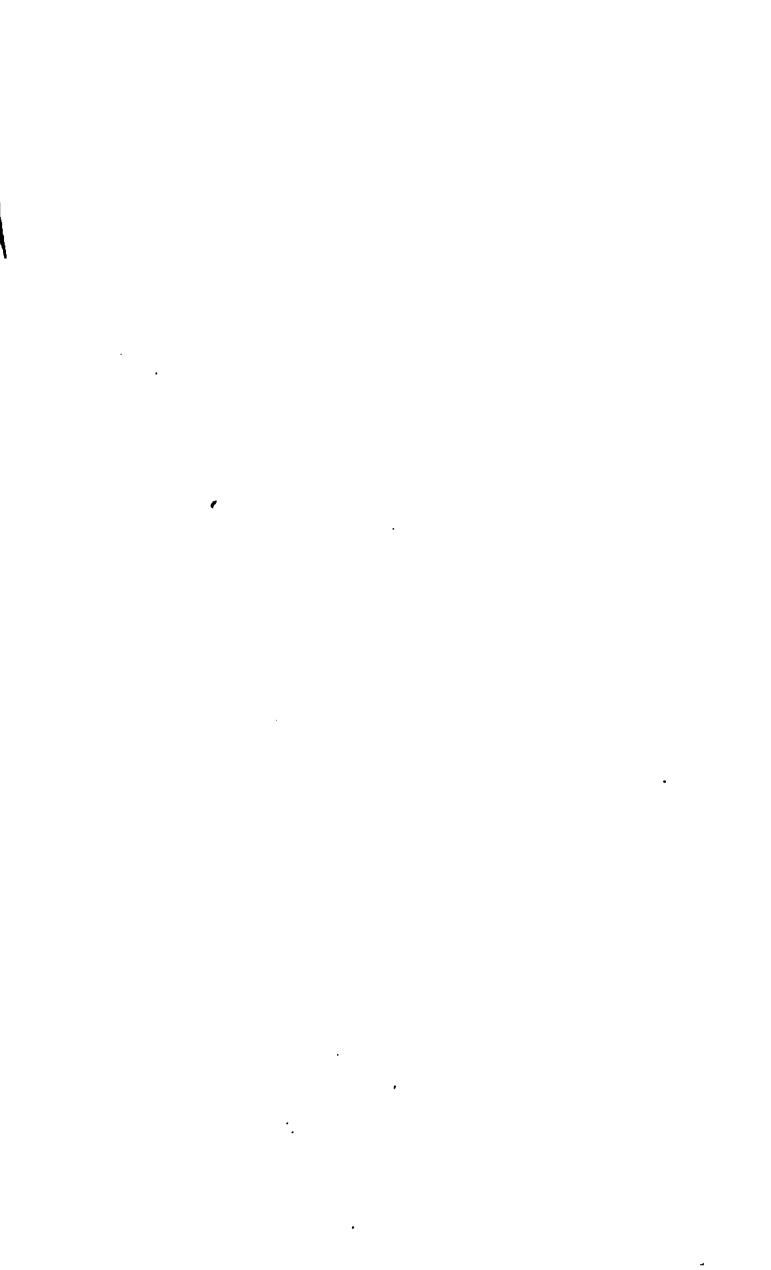
* It was on this occasion that the elder Pliny perished, by venturing too near to obtain a view of the phenomenon. The guides informed an English traveller, who visited this spot some years back, that a *milorde Inglese* had been suffocated there. On inquiring his name, the reply was, they believed it was my Lord Plinio!

Since that period eruptions have taken place from time to time. A long pause, however, occurred between 1306 and 1631; but, during this interval, Monte Nuovo, in the Phlegrean fields, was formed. This took place in 1538.

During the above-mentioned interval of rest, Vesuvius had again become clothed with vegetation, again the abode of cattle and wild animals. But in the year 1631, another tremendous eruption occurred, when the town of Resina, built partly over the ancient site of Herculaneum, was overwhelmed by a current of lava. From that period to the present time, there has been a constant series of eruptions, with rarely an interval of rest exceeding ten years.

The great crater of Vesuvius, from the end of the last century to the year 1822, had been gradually filled up, partly by lava boiling up from below, and partly by volcanic cinders ejected from minor vents on its sides. And thus, instead of a cavity, the summit consisted of a rough and rocky plain, covered with blocks of lava and scorise, and intersected by numerous fissures, from which clouds of vapour were evolved. By the tremendous eruption of October, 1822, the structure of this was wholly changed: violent explosions, which lasted more than twenty days, broke up and threw out all this accumulated mass, leaving an immense gulf, of an irregular, but somewhat elliptical shape, nearly three quarters of a mile in diameter. The depth of this tremendous abyss has by some been considered to have measured, when first formed, 2000 feet from the extreme summit; though other accounts assign less than 1000 feet for its depth. The sides of this gulf have been continually crumbling away from the time of its formation, so that its depth is perpetually decreasing. By this convulsion, the cone of Vesuvius lost 800 feet of its elevation, having been reduced from 4200 to 3400 feet above the sea.

Calabria is subject to terrible earthquakes. A most tremendous convulsion occurred on the 5th of February, 1783, when the first shock threw down, in two minutes, the greater part of the houses in all the cities, towns, and villages, from the western declivities of the Apennines in Southern Calabria, (or Calabria Ultra,) to Messina in Sicily, and convulsed the





Fissure near Polistena.



Circular Hollows in the Plain of Rosarno.

whole surface of the country. Another shock, of nearly equal violence, occurred in March; and, during the year 1783, the total number of shocks was 949; nor did the convulsions cease until the end of the year 1786, having lasted nearly four years. Various physical changes occurred in the surface of the country; a subsidence took place in the quay at Messina: deep chasms and fissures were formed in many places. The latter were almost innumerable near Polistena. One fissure (represented in the cut) was of great length and depth; and the level of the corresponding sides was greatly changed in some parts.

Numerous landslips also occurred: in one instance a small inhabited house was carried down entire, with the mass of earth on which it was standing, without injury to the inhabitants. The olive trees also continued to grow on the land which had slid down into the valley, and bore the same year an abundant crop of fruit. Fifty lakes were also formed, one of which was about two miles long and a mile broad, and of great depth. But perhaps among the most singular effects of this convulsion, was the formation of small circular hollows in some of the plains. These hollows are described as being about the size of carriage wheels: they were sometimes filled with water, but more frequently with dry sand, and, on digging down, they were found to be funnel-shaped.

Forty thousand persons are said to have perished by this dreadful catastrophe; and nearly half that number subsequently, owing to the privations they were compelled to endure, and the epidemics caused by the stagnant water in the numerous newly-formed lakes and ponds.

Calabria was visited by a series of earthquakes, though of comparative unimportance, in the months of October and November, 1841. These convulsions extended to Sicily.

Etna appears to have been in activity from the earliest times of tradition; and sixty-nine great eruptions of this volcano are on record, the most recent of which occurred in November, 1832. This mountain, which towers to the height of 10,963 feet, is chiefly composed of volcanic matter: but the sides are in many parts richly covered with vegetation, to within about 1100 feet of its extreme summit. In this part spreads the

desert plain, consisting of a waste of black lava and scorie, from whence the principal cone rises. Near the base of this cone occurs the remarkable phenomenon of a mass of ice, preserved under a layer of lava.

The grandest and most original feature in this volcanic mountain, is the multitude of minor cones, which are distributed over its flanks, and which are most abundant about half-way up the mountain. Without enumerating numerous small mounds of ashes, where lesser vents have been opened, there are about eighty of these secondary cones, of considerable dimensions. One of the largest, Monte Minardo, near Bronte, is upwards of 700 feet high. Some of these cones have, however, lost much of their original height, by the surface round them having been filled up by volcanic matter, ejected by subsequent eruptions from more elevated vents.

The last considerable eruption, which took place in 1832, was of very fearful aspect, though happily unattended with loss of human life. The city of Bronte was threatened with destruction, a vast stream of lava, a mile in width and thirty feet in depth, having taken the direction of that city; this stream moved majestically onwards, at the rate of about three quarters of a mile a day, and had approached within two miles of Bronte. The city, however, was spared; the lava stream, at this point, was arrested in its progress, and the greater part was received into a large fissure or gulf, formed by some previous convulsion.

A volcanic island was formed, in the year 1831, between the coast of Sicily and the small island of Pantellaria. It received various names, among others that of Graham's Island; but was of very temporary duration. Malta is not volcanic, but there appears reason to conclude that the adjacent small island of Gozo is of volcanic origin.

The Lipari Islands are all composed of volcanic rocks. Stromboli consists of a single conical mountain, having several small craters, all of which, with one exception, are at present extinct; but this active vent is remarkable for its perpetual energetic action, no cessation whatever in its activity having been known to have occurred for the last two thousand years.

In its prolongation westward, the volcanic region passes through Spain and Portugal, the southern parts of both which countries, have at various periods suffered severely from earthquakes; and on the 7th of August, 1841, the shock of an earthquake was felt extensively throughout Spain. Lisbon was violently agitated on February 2nd, 1816; but the most tremendous earthquake in modern times, was that experienced in the latter city in November, 1755. A sound resembling subterranean thunder was heard: this was immediately succeeded by a violent shock, which laid in ruins the greater part of the city, and overwhelmed a fearful number of its inhabitants. The sea first retired to a considerable distance; then, rolling in, it rose fifty feet above its ordinary level, and the mole, with all the unfortunate persons who had hurried thither for safety, sank suddenly below the waters to the depth of several hundred feet. A considerable number of English merchants resided in the city, but of these a very small number perished; for this dreadful calamity occurred on All Saints' day, which, being a Roman Catholic festival and public holiday, the British residents were mostly absent at their villas in the vicinity of the city, and thus providentially escaped. The circumstance of its happening on this day, however, added greatly to the general calamity; for the numerous lights which were, in consequence, burning in the city, caused a very destructive conflagration, which incalculably increased the misery and loss of property among the unfortunate inhabitants.*

The volcanic band extends also across the northern part of Africa; especially in Algiers and Marocco, which have at various times experienced earthquakes simultaneously with Spain and Portugal. Thus, the memorable earthquake of November 1st, 1755, was also felt in great violence in Barbary; and, on the 19th of the same month, the city of Mequinez was buried in the earth by a violent convulsion, which also swallowed up two large encampments of wandering Arabs, consisting of eight or ten thousand persons, together with the whole tract of ground they occupied. Nearly half the city of Fàs,

* As we have given many particulars of the Lisbon earthquake in our *Recreations in Geology*, to avoid repetition, we omit further notice in this place.

or Fez, was likewise destroyed, and the neighbourhood of Marocco suffered greatly.

The Azores are considered as the continuation of the volcanic band, of which they perhaps form the termination, though it is uncertain whether Madeira and the Canaries, may not communicate beneath the waters, with this great region. The Azores are all of volcanic origin; and, although no active vents exist in these islands, there is strong evidence of internal volcanic energy. Hot springs and gaseous exhalations abound; and a temporary volcanic island, to which the name of Sabrina was given, was formed off St. Michael's in 1811. These islands are also subject to earthquakes; a severe convulsion occurred in July, 1757, which violently agitated Terceira, but proved more destructive in some of the other islands. On this occasion, eighteen small islands are said to have been formed off the northern side of St. George's Island; whilst, in other parts, huge masses were detached from the shore, and carried out to sea. The frowning cliffs, in some instances, were so shattered and laid low, that spots formerly inaccessible, became easy of approach, and the means of communication thus opened between some of the islands, where access was previously impracticable.

We have already adverted to the supposed progressive westerly course of some great earthquakes, which occurred in the fourteenth century. A somewhat similar phenomenon appears to us to have been strikingly displayed in the middle of the last century, in the volcanic region we have now been considering. The series of convulsions to which we allude, though not absolutely regular in its westerly progression, yet evidently had a general direction from east to west, extending from the borders of Armenia to the Azores.

As we have already had occasion to mention the greater number of these convulsions, we will here briefly enumerate them in chronological order.

The first indication of these violent subterranean disturbances was exhibited at one of the principal vents, Mount Etna; where, in June, 1754, after some very severe earthquakes by which two villages were swallowed up, a violent eruption occurred. On the 15th of July, of the same year,

a severe earthquake (already mentioned) proved very destructive in the Morea, especially near Lepanto. On the 2nd of September following, the tremendous earthquake occurred, which, commencing at Sivas, on the borders of Armenia (or perhaps still further eastward), convulsed the greater part of Asia Minor, extending also into Egypt, and doing much injury in Constantinople. At the latter city, the movement of the convulsion was observed to have a direction from east to west. On the 4th of December, of the same year, a violent eruption took place in Mount Vesuvius; two streams of lava, one of which was a mile in breadth, having burst forth, threatening destruction to the surrounding country.

On the 2nd of March, 1755, Etna was again in eruption, two streams of lava having poured from the highest crater, which was covered with snow, but which the fiery torrent suddenly dissolved, thus producing a frightful inundation. The convulsions in the more eastern part of this disturbed region do not, however, appear to have wholly subsided; for, in the same month, the severe earthquake already alluded to as convulsing Mitylene, occurred in that island. Towards the end of the year, these tremendous disturbances approached the western confines of Europe and Africa. The convulsions swept across Sardinia and Corsica, agitated the greater part of Spain and the whole of Portugal, and, on the 1st of November, laid the city of Lisbon in ruins. The north-western parts of Africa, as we have already seen, were simultaneously convulsed; and on the 19th of the same month, an earthquake proved terribly destructive in that region. The movement on this occasion was also from east to west; and is said to have travelled at the rate of twenty miles a minute.

After the terrible convulsion above mentioned, a longer pause appears to have ensued; but in July, 1757, the violent earthquake occurred, of which we have already given some description as proving very destructive in the Azores, which appears to have terminated this remarkable series of disturbances, and which, it will be observed, traversed the tract we have mentioned, as forming the central line of the volcanic region from the Caspian to the Azores.

The *Icelandic volcanic region* is a much less extended group, and may be considered as comprehending Iceland, Jan Mayen's Island, and part of the coast of Greenland.* The latter is subject to earthquakes, and Jan Mayen's Island contains a volcano, but Iceland constitutes by far the most important feature in this volcanic region.

Iceland, as far as has been observed, is wholly of igneous formation. It is subject to violent earthquakes, contains some of the most remarkable boiling springs in the world, and its volcanos are prodigiously active, and have been, at intervals, in violent activity from the earliest period of the discovery of this island. Among the volcanos of Iceland, Hecla appears to have been the most regular in its eruptions, and twenty-two formidable ones have been recorded, as occurring within the last eight hundred years; and during the same period, twenty violent eruptions have taken place in the other Icelandic volcanos. So intense is the energy of subterranean heat in this cold region, that some eruptions of Hecla have lasted for six years without ceasing. Earthquakes also have shaken the whole island at once, causing great changes in the interior, rending mountains, causing hills to sink down, changing the courses of rivers, and forming lakes. New islands have also been thrown up off the coast, some of which have been permanent, but others have disappeared, either by subsidences, or by the action of the waves. An island of this description was formed in 1783, and was formally claimed by the King of Denmark, who conferred on it the name of Nyöe, or the New Island; but ere a year had elapsed, nothing was left save a reef of rocks, from five to thirty fathoms under water.

One of the most tremendous eruptions on record in Iceland was that of the Skaptår Yokul, which commenced on the 11th of June, 1783, and did not entirely cease for two years. The immensity of the volume of melted matter ejected on this

* From the continuous form observable in the outline of Greenland and the eastern shores of North America, and from the linear direction, bearing a general correspondence with the form of the coast, so frequently met with in volcanic regions, we should have been induced to place Canada in the Icelandic volcanic region; but we are not aware that any actual observations warrant this conclusion.

occasion, renders this eruption very remarkable. Two streams of lava flowed in opposite directions, one of which extended fifty miles, and the other forty miles in length. The width of the first stream was about twelve or fifteen miles, that of the latter about seven; the ordinary height of both currents was about one hundred feet. The lava flowed into the deep channel of the River Skaptâ, and thus diverted it from its course, in consequence of which, destructive floods ensued, which were greatly augmented by the melted snow that poured down from the mountain. The channel of the Skaptâ was between rocks, from 400 to 600 feet in depth and nearly 200 in width; and not only did the lava fill up this great defile to the brink, but overflowed the adjacent fields to a considerable extent. The lava, after flowing for some days, was precipitated down a tremendous cataract, called Stapafoss, where it filled a profound abyss, which that great waterfall had been forming for ages. The loss of life and property was very great; twenty villages were destroyed, and above nine thousand persons perished, together with an immense number of cattle. The waters off the coast of Iceland, also, were so impregnated with the sulphureous exhalations, that the fish deserted the coast, a circumstance that added greatly to the distress of the inhabitants, who depend in great measure on the produce of the sea for their support. Iceland has scarcely to this day recovered from the effects of this fearful calamity.

Beyond the limits of these volcanic regions, all countries are subject to slight tremors, at distant intervals of time. Thus, slight shocks have frequently been felt in the British Isles, in France, Germany, and other parts of Northern Europe; but these countries cannot be considered as constituting parts of either the Southern European, or of the Icelandic volcanic regions. In many instances, these tremors appear to be mere vibrations, produced mechanically, through the external crust of the globe, and originating in some great convulsion in an adjoining volcanic region. Such were the agitations experienced in these islands, and over a considerable portion of Europe, during the great Lisbon earthquake. In other instances, however, these agitations appear

to be independent of any such great convulsion. The year 1750 appears to have been marked by several commotions of the latter description, occurring in the countries of Europe situated beyond the volcanic region. In the course of that year, a severe shock of an earthquake was felt at Munich and in the surrounding country; numerous shocks were also experienced in France, particularly at Bordeaux, Toulouse, Narbonne, Montpellier, &c., though the shocks were most violent near the Pyrenees, where several houses were thrown down, and many persons killed.

In the same year, two smart shocks were felt in London and its vicinity. The first took place on the 8th of February, and was felt in all parts of the metropolis, as well as at Hampstead and Highgate, and along the banks of the Thames, from Greenwich to Richmond. It was particularly violent at Limehouse and Poplar, where, as well as in Leadenhall-street, some chimneys were thrown down; and, in several parts of the city, the pewter platters (then in use) fell from the shelves. The second shock occurred on the 8th of March, and was more violent, and of longer continuance than the former. This took place at half-past five o'clock in the morning; and many persons quitted their beds and ran into the streets in the greatest consternation. It, however, was attended with no loss of life, although several chimneys were thrown down, and some houses injured. It was particularly violent in the neighbourhood of Grosvenor-square, the copper and pewter utensils in the kitchens having been thrown off to some distance from the shelves. In St. James's Park, the ground is said to have heaved perceptibly. It extended to some distance round London, having been felt in parts of Kent, Surrey, and Hertfordshire. So great was the panic in the metropolis, that many persons, dreading a repetition of these convulsions, quitted London, shutting up their houses and shops, and seeking refuge in the country. No third shock, however, appears to have occurred in the metropolis; but, during the same year, slight shocks were felt in various parts of England.

During the month of October, 1839, several shocks of earthquakes were felt in various parts of Scotland. Although

not severe, they were sufficiently so to cause some alarm; they occurred on the 7th, 10th, 13th, 14th, 16th, and 23rd days of October. The bells were set ringing; persons seated in chairs could with difficulty retain their seats, and stone dikes or walls were thrown down. But the most serious injury caused by this agitation of the earth, was the bursting of the Easburn reservoir, on the banks of the River Carron, the waters of which swept over the adjacent lands, bearing every transportable article before them, and even rooting up young trees. Shocks of earthquakes have also occurred in Scotland in subsequent years.

Compared, however, with the fearful effects of subterranean heat displayed in the volcanic regions of the earth, these tremors appear of trifling importance; and although we may be ready to trust that, in the vast system of nature, these terrific convulsions may be beneficial, and knowing that all "partial evil" is "universal good," we cannot but feel thankful that our highly-favoured country is happily exempted from these appalling and destructive visitations.

But shouldst Thou wreck our father-land,
And mix it with the deep;
Safe in the hollow of thy hand
Thy little ones would sleep!

CHAPTER XVIII.

GENERAL FEATURES OF AFRICA.—AFRICAN ISLANDS.— AFRICAN VOLCANIC REGION.

O'er Africa the morning broke;
And many a Negro land revealed,
From Europe's eye, and Europe's yoke,
In Nature's inmost heart concealed.

MONTGOMERY.

THE vast peninsula of Africa presents some very striking natural features. A large portion of this division of the globe is situated within the tropics; and its extreme northern and southern limits are nearly at an equal distance from the

equator. If, therefore, general uniformity of climate depended solely upon latitude, we might expect to meet with great similarity in this respect in the corresponding regions of Northern and Southern Africa. It, however, appears that the other conditions producing diversity of climate—such as the alternations of highland and lowland, the absence or presence of rivers, the inequality of the mass of land, and consequent remoteness from, or proximity to, the ocean—are exhibited on a large scale in these extensive tracts of land, causing great variety of temperature and fertility.

The whole northern portion of Africa, with the exception of the eastern extremity, is occupied by the extensive range of the Atlas Mountains, and their various branches. These mountains, which in some parts rise above the snow-line, give origin to several rivers and streams, which find an outlet either in the Mediterranean Sea, or the Atlantic Ocean : and although, from the proximity of these mountains to the shores, these streams do not form important rivers, they fertilize the rich plains of Barbary and Morocco. Another great mountain system of Northern Africa occurs in Abyssinia, that country being described as consisting of an alternation of mountains and elevated table-lands or mountain-valleys. The mountains of Samen, among which Lamalmon is included, attain a considerable elevation ; but the range of Gojam, situated further southward, is yet more lofty ; the peak of Geesh, which has an altitude of 15,000 feet above the sea, belonging to the latter group. It is among these mountains that the Bahr-el-Azrek, or Blue River, long considered as the true source of the Nile, takes its rise.

The easterly portion of Africa appears to be occupied by ranges of mountains, more or less continuous, among which we meet with Kilmandjaro, 20,000 feet above the level of the sea ; and, according to recent accounts, with another yet loftier snow-capped summit. The mountains of Southern Africa, though not remarkable for their elevation, are of sufficient altitude to effect very important modifications in the climate and temperature of this region. The Mountains of the Moon, situated to the north of Lake Ngami, present some snow-capped summits, and the Nieuveltdt Mountains reach the height of nine

or ten thousand feet above the sea. The Kous Mountains, which separate Caffraria from the Bechuana country, do not appear to exceed six thousand feet in height; and the Cedar Mountains, with their prolongation, the Kamies or Lion Mountains, range from one thousand six hundred to five thousand feet above the sea-level. The Cedar Mountains are described by Sir James Alexander as being very beautiful, with a highly picturesque outline, and adorned with great numbers of the cedar of Lebanon, which tree here attains a magnificent size, and with which these mountains were formerly covered. Marine fossils are found in this range, at the elevation of two thousand feet above the sea; and fine jasper, agates, and garnets, are of frequent occurrence. The extreme south is occupied by the conspicuous, though not very elevated mountain group, which rises immediately above Cape Town, and which includes the precipitous table-mountain, 3380 feet above the sea, and its two supporters, called the Devil's Head and the Lion's Head.

In Western Africa we meet with the Qua Mountains and the Rumli range; the former being about five thousand, and the latter three thousand feet in general elevation. The most lofty mountain in this portion of Africa is the Peak of Cameroon, which attains the height of thirteen thousand feet above the sea, and is covered nearly to the summit with trees of luxuriant growth. This elevated mountain is situated at no great distance from Fernando Po, in which island the lofty summit of Clarence Peak reaches the height of ten thousand feet. Between Fernando Po and the mainland, there is a depth of forty fathoms; and this locality appears to present one of the most remarkable undulations on the surface of the globe. The Kong Mountains, which commence at Cape Verde, and form the southern boundary of the Sahara, extend to an unknown distance in the interior.

The most striking feature, however, in the natural geography of Africa, is the great extent of desert occupying various portions of this region, and which, for the most part, is without elevated land, and destitute of streams of water. The deserts of Northern and Southern Africa, however, although they may agree in their general character, differ very

considerably in their particular features. The Sahrà, or Great Desert, as before observed, with the exception of an occasional wady, or oasis, consists chiefly of low, rocky hills, and boundless extents of moving sands, parched and pulverized by the intense heat of a tropical sun. "There," says Sir Edward Belcher, "the very atmosphere is sand; the grains of drift-sand varying in size from an almost impalpable powder to that of hemp-seed." "I found," continues the same officer, speaking of the country round Cape Blanco, "the grains equal to dust-shot, almost insupportable; but what must a gale of hemp-seed size prove!" Such, however, is the nature of this vast desert, which covers an area nearly three times as great as that of France, and which extends from the shores of the Atlantic to the borders of Egypt.

In such a country, where there is

No shade, all sun, insufferably bright,

we shall not expect that animal life will appear in the same exuberance as in well-watered lands, situated in parallel latitudes; and, in fact, we find that, with the exception of an occasional troop of gazelles (fig. 90), or of ostriches (fig. 128), occurring on its outskirts, or perhaps a few jerboas (fig. 50), and similar animals, in the vicinity of the wadys, a small number of beetles, and other insects adapted to endure the scorching heat of these arid sands, the Sahrà may be said to be entirely destitute of inhabitants. As we approach the borders of Egypt, the wadys become more frequent, and of greater extent; and at length, on the borders of the Nile, the desert tract is changed into one of the greatest fertility. The occurrence of these wadys, or oases, wherever springs exist, leads to the conclusion, that the sterility of the Sahrà arises from no peculiarity of the soil, but from the absence of water; there being no rivers to irrigate and fertilize the western portion of this belt, and rain being almost unknown in its whole extent. This deficiency of water arises in great measure from the configuration of its surface, and its want of trees. We have seen that mountains and trees attract and condense moisture, and as this region in its interior is destitute of both those requisites, the few clouds which may be wafted across it from

the Atlantic become rapidly dispersed by the intense heat, and do not descend in refreshing showers.

Between the Sahrà and the Atlas Mountains, extensive districts are covered by the date-palm (fig. 175), an abundant supply of food being thus bountifully provided for the inhabitants of the territory bordering on that desolate waste.

The deserts or karroos of Southern Africa differ widely from the Sahrà, approaching rather in character to the steppes of Northern Asia. This difference is attributable, partly to the undulations of the surface in Southern Africa, and partly to the greater proximity of every portion of this region to the waters of the ocean; in consequence of which, these districts receive abundant supplies of rain. These rains are, however, periodical, and the karroos experience a *dry season*, at which time all vegetation disappears. Like the Sahrà, they possess a sandy soil, but this, instead of presenting a moving surface, is firmly bound together by the fibres and roots of various plants, which at all times derive a certain supply of nourishment from the soil; but which, in the rainy season, spring up, and cover the whole country with rich and spontaneous verdure. These karroos are not, therefore, like the arid Sahrà, unsuited for the support of animal life; but, on the contrary, are peculiarly adapted for the temporary sustenance of such graminivorous animals, as possess sufficient speed of foot to enable them to traverse a considerable extent of country in search of congenial food. And, accordingly, we find that the Creator has adapted the animal to the vegetable productions of this region, for no country abounds so much as does Southern Africa with vast herds of gazelles, spring-boks, and other species of antelopes.

A large portion of Central Africa being wholly unknown to Europeans, we cannot attempt to trace even an outline of the interior districts; though under this head we may, perhaps not inappropriately, consider the fertile regions situated to the south of the Sahrà, to which latter this portion of Africa presents a strong contrast. This difference is, however, readily accounted for by the different nature of the surface; the regions we are now considering being traversed by lofty mountain ranges, which give rise to numerous magnificent

rivers, and diffuse both coolness and moisture over the whole district; thus rendering it one of the finest countries on the face of the globe. These mountains approach the Atlantic near Sierra Leone, which place has received its name from the lofty peaks in that vicinity, these being called the Sierra Leone, or Mountains of the Lions. Another branch, which extends to Kong, terminates with a lofty cone, near which is a rich deposit of gold. This mountain system stretches into the interior, presenting a varied and picturesque aspect, and giving rise to the rivers Senegal and Quorra, or Niger, and various other rivers which flow into the Atlantic, whilst in its eastern prolongation it forms the source of the Bahr-el-Abiad, or White River, which constitutes the leading stream of the Nile, and takes a northerly course. These mountains are described as attaining a considerable elevation in the kingdom of Bornou, as also in their extension southwards, where some of the peaks bear a resemblance to the aiguilles of Mont Blanc.

The general character of the valleys and plains in this region is that of beauty and fertility. Watered by tropical rains, and intersected by numerous streams, vegetation in this zone becomes exuberant in the extreme. The borders of the rivers are enriched by fine woods; and rice, or wheat, according to the nature of the surface, is cultivated with great success. In Bornou, however, these useful grains are entirely superseded by a small species of grain, termed *gussub*, held in great esteem among the natives. Some districts, among which is the country of Zegzeg, not only yield plentiful crops of grain, but are also described as covered with fine pastures, and as being beautifully varied with hill and dale, resembling the finest scenery of England. All parts, however, are not quite so delightful; some spots, especially the vicinity of the Lake Tchad, being covered with impenetrable thickets and rank grass of remarkable height, the resort of numerous elephants, lions, panthers, hyænas, &c.

Gold occurs very abundantly in this part of Africa, especially in the district of Ghonah, where large quantities are found in all the plains, banks of rivers, rocks, and stones.

Having considered the interior of this continent as far as our limited means will enable us, let us now turn our attention

to the districts bordering on the coast, commencing with those situated between the Atlas and the sea. The north-western portion, forming the empire of Morocco, or Marocco, is perhaps more favourable for the habitation of man than any other part of the coast. The land extending from those mountains to the ocean is generally level, although approaching in character to that of table-land. There is a great want of wood, but the soil and climate are admirably adapted for the growth of corn, although a considerable portion is now covered with unprofitable weeds. Maize, or Indian corn, is extensively cultivated; as is also dhoorah (here called Guinea-corn). The cork-tree, palmetto (fig. 172), date, almond, olive, walnut, and a great variety of fruit-trees, are met with; besides the rose, myrtle, cactus, aloe, &c.; whilst in the spring, the ground is enamelled like a carpet with the iris, crocus, daffodil, and narcissus, and adorned with the gay blossoms of lupines, African marigolds, &c., in full flower. The mountains of Atlas rise very abruptly from this plain, and are in some parts covered with pines of immense size; as also with cedar, mountain ash, fir, and juniper. The most elevated part of the Atlas range is situated in this territory; Miltzen attains the altitude of 11,400 feet above the sea; but other summits, yet unmeasured, are supposed to exceed that elevation.

Various branches diverge from the Atlas range, and enter the territory of Algiers, the ancient Numidia, giving it a diversified character. These mountain ridges are intersected by valleys of great beauty and fertility, adorned with the most luxuriant groves of pomegranate, orange, and citron; grapes and melons also arrive at great perfection, and olive-trees attain a remarkable size. To the eastward of Algiers, the Atlas range recedes further from the coast, leaving at its base the spacious and fertile plain which forms the territory of Tunis, where anciently stood the famous city of Carthage. The most northerly point of Africa, Cape Bon, is situated in this district; and the whole coast, from that spot to the Straits of Gibraltar, is exceedingly bold and picturesque. The country to the eastward, however, presents a totally different aspect; the great mountain range of the Atlas, which, with its various

subordinate branches, performs so prominent a part in diversifying the surface, and thus diffusing verdure and fertility over the western districts, here terminates; and although Tripoli and Barca contain some fertile tracts, in which barley and dhoorah are cultivated, a large portion of this territory consists of sandy and desert plains. Opposite to Tripoli lies the island of Zerbe, once inhabited by the Lotophagi, thus alluded to in the *Odyssey* :

They eat, they drink, and Nature gives the feast;
The trees around them all their food produce;
Lotos the name, divine nectareous juice!
Thence called Lotophagi.

So fascinated were some of Ulysses' companions by the fruit of the lotos, that they were compelled to be removed by force from the spot :

The three we sent, from off th' enchanted ground
We dragged reluctant, and by force we bound.

The lotos of Homer is supposed to have been the *Ziziphus* lotos, a tree or shrub met with in many parts of Northern



Ziziphus Lotos.

Africa. It bears small farinaceous berries, of a yellow colour, described as of delicious taste. These berries are much esteemed by the natives, who dry them, and make them into cakes, said to resemble delicate gingerbread in flavour. A sort of wine is also prepared from them; and we cannot but suppose that it was the latter "divine nectareous juice," rather than the simple berries, that proved so fascinating to the companions of Ulysses.

Egypt, so interesting from the recollections, both sacred and classical, with which it is associated, consists of a spacious valley, bounded by mountains and deserts, owing its existence solely to the Nile, of which it has been emphatically termed "the gift." The traveller who visits this country in the dry season beholds—with the exception, however, of the very banks of the river, for even at this period of the year the Nile winds its way among emerald-green pastures, gardens, and date-groves—only a vast dreary plain, enclosed by whitish and bare mountains, and sprinkled with a few trees and withered shrubs. On the 18th or 19th of June, however, the waters of the Nile begin to rise, and continue to increase until September, at which time they attain their greatest height, and the country resembles an extensive lake; amid the waters of which appear occasional patches of date-trees, fig-trees, acacias, tamarisks, willows, &c. The waters subside as gradually as they rise, leaving behind them a rich deposit of alluvial soil, in which spring up the most splendid and redundant harvests; no region on the earth, perhaps, exceeding this in fertility. In Upper Egypt the surface of the land is more mountainous, and the breadth of the valley less extensive. In Nubia this becomes still more contracted, the latter territory consisting of a narrow belt of land of great length, which, like Egypt, is rendered fertile by the Nile, and to the south of which rises the mountainous country of Abyssinia, where range succeeds to range, presenting rocky heights of the boldest and most rugged character.

The narrow valley, constituting the basin of the Nile, is enclosed by two not very elevated ridges or plateaus, varying in width from 120 to 150 miles, the one, called the Arabian chain, being situated between Egypt and the

Red Sea, and the other, called the Lybian chain, separating it from another region of nearly similar character, which is itself again divided from the desert by an abrupt mountain chain. These ridges perform a most important part in the preservation of this fertile country; for had not these protecting barriers intervened, the vast ocean of sand would long ere this have inundated and overwhelmed the whole region.

In speaking of the Great Desert in the vicinity of Cape Blanco, some allusion has been made to the drift-sand of the Sahrà, which, being readily displaced by the wind, is not unfrequently carried to a considerable distance in a few hours. But, in the prodigious accumulations of sand in the reservoirs of the desert, which are termed *sahel* by the Arabs, the sand is disposed in successive undulations, like the waves of the sea, in some instances forming hills, and even mountains. These mighty masses of sand, unless opposed by some obstacle of sufficient power to arrest their progress, move slowly and almost insensibly forward in the direction of the prevailing winds, being capable, by their resistless power, of overrunning whole countries, of burying towns, and changing the course of rivers. In fact, an Egyptian city, which was not protected by any barrier, has been discovered entirely immersed beneath the sand; and it is well known that the Sphynx at the foot of the Great Pyramids, which at a former period was wholly above ground, is now buried under forty feet of sand.

The animals of Northern Africa include vast numbers of apes; lions of the largest and finest description, which are very numerous; leopards, hyænas, and jackals; herds of elephants; and, in the mountainous districts, bears and wild boars; whilst the hippopotamus and crocodile frequent the rivers. Ostriches are very numerous, and the sacred ibis of the Egyptians (fig. 130) still frequents the banks of the Nile, whilst the sandy tracts abound in bustards and quails. Among domesticated animals, the horses of Barbary are celebrated; and not less valuable is the camel, called also the *herie*, which not only bears the traveller across the desert tracts, but affords a supply of milk for his nourishment during the journey.

The vegetation of Northern Africa bears a great resemblance to that of Europe on the opposite shores of the Mediterranean

Sea, though Egypt possesses some plants belonging to inter-tropical regions, the seeds having probably been carried down by the waters of the Nile, and deposited in the rich bed of alluvial soil they leave in their passage. The vegetation of the western districts of Northern Africa, having been already incidentally noticed in our review of those regions, we shall now direct our attention to that of the eastern parts, and more especially to that of Egypt.

The sandy plains present, generally, a surface totally destitute of vegetation; but in spots where springs occur, the tamarisk, acacia, mimosa, caper-plant, &c., are met with; whilst the more saline soils occasionally produce the salt-worts and the mesembryanthemums, the latter plants being especially adapted for thriving in arid situations, their peculiar organization enabling them to retain an abundant supply of moisture, even during the period of greatest drought. The declivities of some parts of the beautiful mountains of Abyssinia are covered with thick forests of tamarinds, and lofty wild citron and orange trees; at a certain elevation these disappear, and are succeeded by gigantic cedars, which, in their turn, gradually decrease in size, and become at last quite stunted and dwarfish. The most remarkable plants on these mountains, however, appear to be the aloes and cacti; the aloe is described as presenting a magnificent appearance, and the cactus as being of various species, and of the most diverse forms, growing like a wood, through which it is difficult to find a passage.

Among the plants of Egypt, one of the most remarkable is the papyrus (fig. 211), from the white pith of which the ancients prepared their paper. The sacred lotus of Egypt (fig. 2), which is a kind of water lily, is another remarkable plant; and the Egyptian arum (fig. 200) is extensively cultivated for its large esculent roots. The bean is supposed to be a native of Egypt, and the cerealia have at all periods abounded in that country. The onion (fig. 188) attains such peculiar excellence and fine flavour in this country, that among the ancient Egyptians it formed an object of worship; and the modern inhabitants of Egypt assign it a place in their

paradise. This country is no less celebrated for the superiority of its melons and cucumbers, the latter especially, being considered not only to surpass those of other countries, but to be exceedingly wholesome. This excellence of the cucumbers, the melons, and the onions, of modern Egypt, cannot fail to strike us as highly interesting, from the remarkable instance it affords of the correspondence of the vegetable productions, for which that country is noted at the present time, with those for which it was celebrated in the most ancient historical periods; when (as we read in the Book of Numbers) the Israelites, during their sojourn in the Wilderness, murmured, saying, "We remember the cucumbers, and the melons, the leeks, the onions, and the garlic."

Eastern Africa, extending from Abyssinia to Caffraria, is but little known. Barbur, which is situated immediately to the south of the Straits of Bab-el-Mandeb, contains some lofty mountains, which approach within four miles of the sea, and are covered with pasturage. Camels are particularly abundant in this part, and form the principal food of the natives. This country is considered to be the original habitation of frankincense, myrrh, and various other odoriferous gums, the region extending from the Straits of Bab-el-Mandeb to Cape Gardafui having, at a very early period, acquired the name of *Aromata*, from its produce of various perfumes, spicy drugs, and kinds of incense. And Dr. Edward Hinkes concludes, from a mandate he has discovered on an Egyptian papyrus, that Egypt, 3000 years ago, was supplied with aromatic drugs from this territory.

Proceeding from Barbur, we first meet with a district of arid and sandy character; and further southwards we arrive at Sena, distinguished for the remarkable fertility of its soil. Natural advantages are, however, usually bestowed in vain, if neglected, or left unimproved by man; a very small amount of labour would secure exuberant crops; but the supine inhabitants of some districts in this territory, presuming upon this extreme fertility of their land, and preferring a life of indolence and ease, neglect its culture; the consequence of which is, that in those parts even famines are not unfrequent. Whilst considering this striking instance of apathy and indo-

lence, we, who inhabit a country less favoured by nature, cannot but feel, that though in our land

Niggard Earth her treasures hide,
To all but labouring hands, denied,
Lavish of thorns, and worthless weeds alone;—
The boon was half in mercy given.

Continuing our southward course, we arrive at “Sofala, thought Ophir.” This place formerly carried on an extensive trade in grain, and in gold and silver; but the introduction of the slave trade has transformed this seat of peace and agriculture into a scene of war, bloodshed, and misery.

Tell, if thou canst, the sum of sorrows there,
Mark the fixed gaze, the wild and frenzied stare,
The rack of thought, the freezings of despair.

The once flourishing Sofala, or Ophir, from whence, at its first discovery by Europeans, as well as in the days of King Solomon, the finest gold was procured, now consists only of a paltry fort, and a few miserable mud huts.

Our knowledge of the vegetable productions of Eastern Africa is very limited. Besides the odoriferous gum-bearing plants, the most remarkable known are the columbo plant (fig. 122), which grows spontaneously in the thick forests of Mozambique; and the *Telfairia volubilis*, which is a climbing plant, discovered within a few years on the coast of Zanzibar. The latter valuable plant, which is said to be easily cultivated in a suitable climate, produces an esculent fruit three feet in length, and full of seeds, which are 264 in number, of the size of chesnuts, and described as equalling the almond in flavour, and also yielding an abundant supply of oil, not inferior to that of the olive.

In South-Eastern Africa, ostriches are unknown; but lions, panthers, buffaloes, antelopes, and elephants are very numerous; and this region affords vast supplies of ivory.

The surface of Southern Africa has been in some measure described; its natural productions are of considerable interest. Abundant supplies of copper ore and iron have recently been discovered. The latter occurs near the Great Fish River, in a very remarkable form; masses of iron, of that peculiar composition considered by chemists to have a meteoric origin,

being scattered in abundance over a considerable tract of country; conveying the impression, that a shower of meteoric iron must have fallen in that locality.*

Large portions of this region are occupied by the karroos; other parts are covered with dense brushwood, consisting chiefly of low thorny bushes, which form the favourite haunts of the Boschismans, or Bushmen. But other parts, again, present an assemblage of magnificent and valuable trees, as well as beautiful and singular flowering plants. Among the former, we find the chesnut, almond, and plum; superb fig trees, attaining the height of sixty feet; orange and lemon trees, mimosas, acacias, the black ebony, the willow, &c. An admirable fruit, about the size of a shaddock, already alluded to, is mentioned by Sir James Alexander as growing near Walvisch Bay, on which the inhabitants of the territory in that vicinity subsist for three months in the year. The flora of this region includes a considerable number of the chief ornaments of our conservatories, as well as various species which rank among our "half-hardy" plants. Amidst these, the heaths (fig. 123) stand pre-eminent, both in beauty and elegance of form, and in variety of species. Nor are they confined to a limited range of elevation: hill and plain are equally adorned with the different species, and our conservatories boast of at least five hundred species and varieties, all of which are derived from this region. The proteas are another numerous family, as are also the mesembryanthemums (fig. 24), and the pelargoniums. Here, too, occurs a peculiar group of euphorbias (fig. 52), which assume various singular and fantastic forms, and many of which rise to a considerable height. They all contain (like our little *Euphorbia helioscopia*, or wart-wort,) an acrid milky juice, which forms a powerful poison. The stapelia (fig 137) is another remarkable genus of plants, with square, succulent, leafless stems, and flowers much resembling a star-fish, which, from their offensive

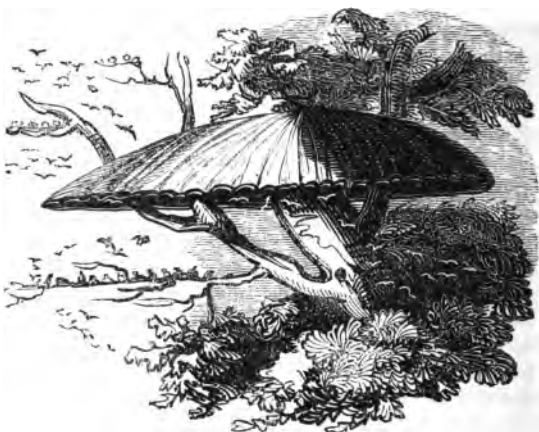
* The fall of a meteorite, which occurred on the 13th of October, 1838, at the distance of about a hundred miles from Cape Town, is remarkable, when considered in connexion with the above account. This meteor is described as having equalled the moon in brilliancy and apparent size; and as having fallen without noise or explosion. The mass of meteoric matter is said not to have been less than four cubic feet in dimensions.

odour, are called carrion flowers. The *ixia* (fig. 169) is another genus peculiar to this region; whilst the aloes (fig. 192) are very numerous, as are also the *gnaphaliums* and *xeranthemums*, and the terrestrial orchideæ. One of the most singular plants, however, is the *Tamus elephantopus*, or elephant's foot, called also Hottentot's bread (fig. 196). In this extraordinary plant, the bulb stands entirely out of ground, and grows to an enormous size, being frequently three feet in diameter. It contains a fleshy substance, like a turnip in consistence and colour, which is eaten by the Hottentots.

It has been already mentioned, that the fauna of Southern Africa is, in great measure, distinct from that of the northern region of this division of the globe, if not in genera, at least in species. The quadrupeds of the region we are now considering are both numerous and varied, and include the chacma, or pig-faced baboon (fig. 5), the lion (fig. 11), hyæna (fig. 21), proteles, or aard wolf (fig. 22), jackall, Cape ant-eater, or aard wark (fig. 63), elephant (fig. 66), white rhinoceros, two-horned rhinoceros (fig. 69), hippopotamus, wild boar, with its enormous tusks, zebra (fig. 79), quagga, southern giraffe (fig. 83); a great variety of antelopes, among which are the fleet and agile spring bok, the algazel (fig. 91), and the gnu (fig. 93); the Cape buffalo (fig. 96), &c.

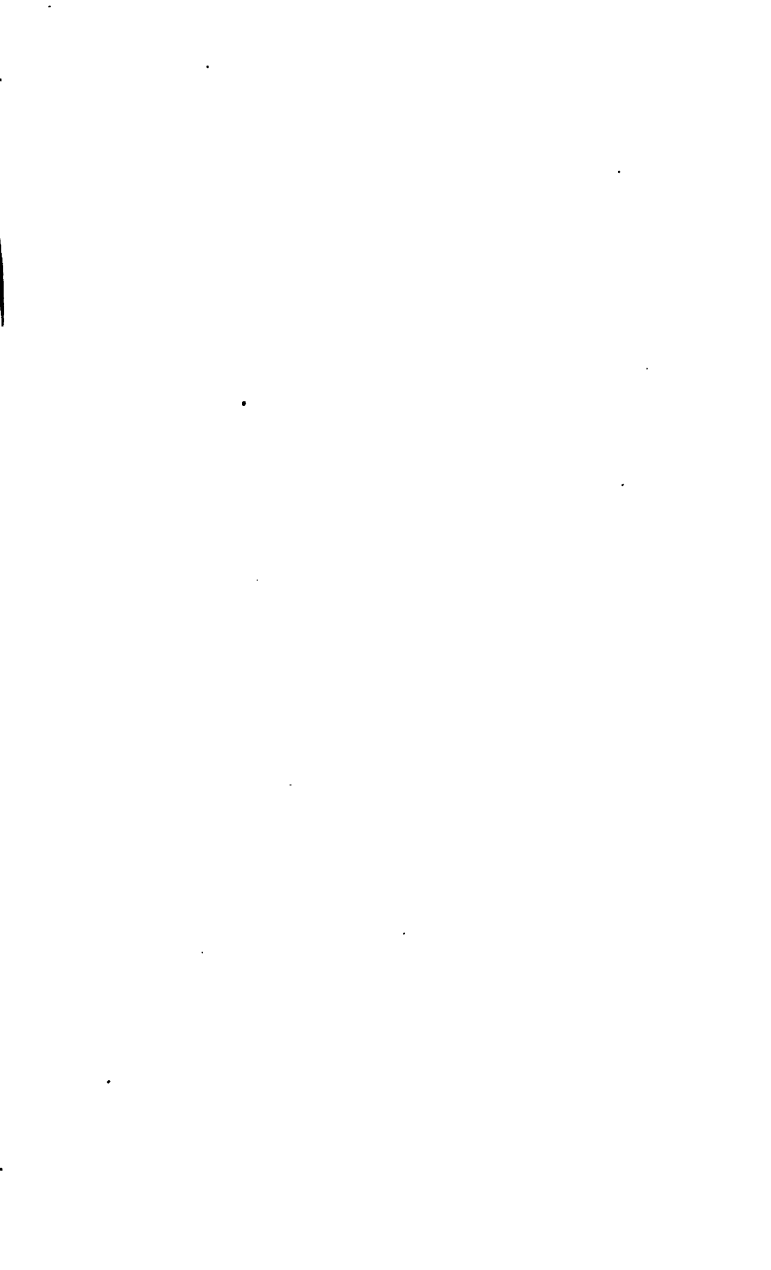
The birds also are abundant, and flocks of vultures of various species are seen in the karroos, where the remains of numerous quadrupeds, killed either by beasts of prey, or perishing in the course of nature, require to be removed. Eagles and falcons are met with in considerable numbers, as also, the barn owl and great horned owl, which are supposed to be of the same species as those of Europe: whilst the secretary bird, or snake eater (fig. 117), which is peculiar to Southern Africa, roams over the sandy plains, carrying on a perpetual warfare with all kinds of reptiles; and the fishing cormorants of the Cape, which usually unite to form large fishing parties, commit great depredations among the finny tribes. The Cape honeysucker, and Cape coly, are small birds of dull-coloured plumage, but rendered conspicuous by the length of their tails. The honey guide is a native of this region, and is held in high estimation by the Hottentots, to

whom it forms a guide to the stores of the wild bees. This bird feeds chiefly on bees, and on their honey, and by a peculiarly wise provision, it is furnished with a remarkably thick skin, adapted to fortify it against the attacks of the insects whose treasures it invades. Perhaps, however, the most remarkable birds met with in this region, are the weaver birds. The beautiful scarlet weaver bird builds its nest among the reeds; this is composed of twigs, closely interwoven with cotton, and divided into two compartments. But the nest of the republican, or social weaver bird, is yet more curious. These birds live in vast societies, and their nests are united under one common roof. These remarkable encampments, or villages, progressively increase in size, the birds being observed to add to the dimensions of their common dwelling every season, until the trees, unable to support any additional weight, sometimes fall to the ground, and the birds are compelled to seek a new site for their habitation. These little towns are said to have numerous



Nests of the Social Weaver Bird.

entrances, each of which forms a regular street, with rows of nests on each side, about two inches distant from each other;





Mangrove.—*Rhizophora Gymnoriza*.

and a village or community sometimes contains eight hundred or a thousand.

The coast of Western Africa next claims our attention ; the southern districts, however, appear generally unproductive. To the north of Walvisch Bay, the Quawas, or Claytrap Mountains, approach the shore ; these mountains, about 2000 feet in height, form a conspicuous land-mark, known to mariners as the Blue Mountains. Some of the rocks in this part of Africa appear to be volcanic : and at a short distance to the northward of this district, a singular effect is produced by some rocks, which contain a considerable proportion of mica and quartz, and which are described as appearing quite dazzling ; one cliff in particular " reflecting the sun's rays like a mirror." To the northward of Espiegle Bay, the face of the country becomes more diversified ; in some parts presenting ridges of park-like land, verdant hills, and luxuriant and beautiful valleys, often clothed to the water's edge with the richest verdure ; though other parts are low and swampy, and present nothing but " mud and mangrove trees." The mangrove, although not useful as a timber tree, is, however, singularly adapted for the situation it occupies ; and in various tropical countries, the different species of mangroves flourish on the shores of the sea, and on the borders of streams and other watery places, where no other trees will grow, and not only afford shelter to vast numbers of animated beings, but perform an important part in the economy of nature ; gradually preparing the land by their decay, for the reception of other plants of greater utility to man.

Passing the lofty peak of Cameroon, and the mouth of the Quorra River, we arrive at the shores of Ashantee, usually called the Gold and Ivory Coasts, which are flat, and covered with thick forests. To this district succeeds the Grain Coast, so named from a species of pepper obtained from thence, which, before the introduction of the East Indian spices, was highly esteemed in Europe, and termed " grains of Paradise." It is produced by a small parasitical plant, the fruit of which contains aromatic seeds or grains. Between this and Cape Verde, the country is chiefly marked by the mouths of various rivers, which discharge their waters into the Atlantic, and the

banks of which are generally finely wooded and fertile. Near Cape Verde, the most westerly point of Africa, the sandy soil bears a vast number of the gigantic baobab trees, which impart to this spot the verdant aspect from which it has obtained its name. The interior of the country is of a mountainous character, and abounds in gold. The River Senegal terminates the fertile tracts of Western Africa, and the Great Desert extends from thence to the borders of Morocco.

The vegetation of Western Africa includes some remarkable and valuable plants. Among these we find the majestic bombax or silk cotton tree (fig. 34); the baobab, or *adansonia* (fig. 35), one of the most valuable plants of this region, the fruit of which, called monkey bread, forms a principal article of food with the natives; the African earthnut (fig. 66), remarkable for maturing its fruit underground: after the blossom withers, the flower stalk bends downwards, and the pod is buried in the soil, where it perfectly ripens; the nut, or bean, is eaten, and likewise produces a valuable oil. Various other edible fruits are also met with, such as the African custard apple, the mammee apple, the African locust tree, the pods of which contain a farinaceous substance, used as food; the peach of the negroes (fig. 130), which is a large and fleshy fruit; various plums, tamarinds, &c. &c., and the shea, or butter tree, which abounds in a yellow greasy juice, which the natives mix with their food.

A curious creeping plant "as thick as a man's arm," was noticed by Mr. W. Cooper Thomson in his recent journey from Sierra Leone to Timbo, which he describes as "resembling the common vine in form and bark, which yields when severed an abundance of clear, cool, and most refreshing water. It is called by the Timné people, the Kosso's bottle; because the warriors of that nation use no other water, when travelling in these forests." From the same authority we learn, that the frankincense tree fills the air with its perfume so powerfully, as to be almost oppressive: the occurrence of the latter plant showing the relation of this region with Eastern Africa.

Plantains, cocoa-nuts, pine-apples, and various other fruits, have been introduced, but are not considered to be indigenous

to Africa. The same remark applies to rice and maize. The oil-palm (fig 185), from which palm oil is obtained, and the pandanus candelabrum (fig. 198), are, however, natives of this soil, and very abundant in this region. The oil-palm, from its great value, has been termed "the native's friend;" it supplies them with wine, oil, palm nuts, an excellent repast in the "cabbage," or young sprouts, besides materials for fishing tackle, hats, baskets, and various other purposes.



Leaf and Fruit of the Butter Tree.

Separated as is this region from Northern Africa, by the Great Desert, its animal productions are found generally to approach nearer to those of Southern than of Northern Africa. Its most characteristic feature, as far as its zoology is known, appears to be the preponderance of animals of the monkey tribe; among which we meet with the mona monkey (fig. 3), the red monkey, and the green monkey. Numerous large

apes and baboons also occur, including the Chimpanzee (fig. 2), which seems to be known over a large portion of Western Africa, and of which it appears, from the recent investigations of Professor Owen, there are two species, one of formidable size, larger than the great ourang outan. Antelopes are very abundant in this, as well as in other parts of Africa; and some species are more particularly so in this region: among these are the harnessed antelope, and ribbed antelope, which are very elegant and beautiful animals. The lamantin, manati, or sea-cow, frequents the mouth of the Senegal.*

The birds of Western Africa are very splendid, and include the beautifully coloured sun-birds, the golden orioles, the hoopoes, the rollers, adorned with the brightest tints of azure, purple, and green, and the beautiful bee-eaters. The only gallinaceous bird of any importance, is the Guinea fowl, which has long been domesticated in Europe. The insects are innumerable, and many of these form articles of food with the natives. Locusts (fig. 180) are exceedingly abundant; but the myriads of ants which swarm in tropical Africa almost exceed conception. They are of numerous species, but all possess similar destructive propensities: and, although they are serviceable in removing from the earth decayed animal and vegetable substances, which are no longer necessary or useful in the economy of nature, these creatures prove dreadfully annoying to man: destroying his food, furniture, books, clothes, and even the timber of his dwelling. The remarkable habits and extraordinary pyramidal nests of the termites, or white ants (fig. 181), render them objects of great interest to the student of nature.

Among the islands of Eastern Africa, Madagascar holds a prominent place. It is 960 miles in length, and has a width varying from 200 to 500 miles. Being thus surrounded by the sea, and also traversed by a ridge of high mountains, it enjoys, notwithstanding its warm latitude, a temperate and pleasant climate. Among the indigenous plants used as food, are the yam, arum, bread-fruit, and plantain; the sugar-cane is also a native of this island, and the cocoa-nut abounds on

* This animal, which raises itself out of the water to suckle its young, is supposed to have given rise to the fabulous accounts of mermaids.

its shores. It contains many valuable timber trees, and various species producing ornamental woods; among the latter is the ebony (fig. 125). The dragon's blood tree (fig. 190), the banyan, and the famous tanghin poison tree, are also included among its natural productions. Turning to the animal kingdom, we find the fauna of this island differing considerably from that of Africa; the macauco, or lemur (fig. 6) here supplies the place of the apes and monkeys, which are not met with in Madagascar. The lion, horse, and elephant, are also unknown in this island; but wild swine are numerous, as are also crocodiles, lizards, chameleons, and serpents; though it is said that none of the latter are venomous. Scorpions (fig. 170) and centipedes likewise abound; and fire-flies are met with in great numbers.

To the north of Madagascar is situated the small group of the Seychelles Islands, remarkable for producing a peculiar species of palm-tree, the *lodoicea sechellarum* (fig. 184), which bears the double cocoa-nut, called also *cocos de mer*. The *lodoicea* attains a height of eighty or ninety feet, and is surmounted by a beautiful crown of winged and palmated leaves. The diameter of the stem varies from twelve to fifteen inches, and the whole is so flexible, that the tops of those trees which stand in each other's vicinity, strike and chafe against each other in a strong breeze, making an extraordinary noise. The leaves open like a fan; they are of large size, often attaining a length of twenty feet or more, with a breadth of ten or twelve. The fruit is generally double, but sometimes triple, or even quadruple, and with its enclosing drupe, attains a length of fifteen or twenty inches, with a circumference of three feet, sometimes weighing from forty to fifty pounds. The uses to which the *lodoicea* is applied are very numerous.

The natural productions of the islands of Mauritius and Bourbon, as may be expected in detached islands of not very large dimensions, are not numerous; the principal native mammiferous animals consisting of a few species of bats. The celebrated dodo, a gigantic species of pigeon, once an inhabitant of Mauritius, has apparently long been extinct. The great black Indian tortoise is a native of the shores of

this island, as well as of those of Madagascar. The marine shells are remarkable for their beauty and profusion; but, as well as most of the other productions of these islands, are similar to those of the Indian Archipelago.

The vegetation of the islands on the western side of Africa bears a general resemblance to that of the main land. St. Helena, however, contains many species peculiar to itself, though none of particular general interest. The island of Ascension possesses a very scanty flora; containing few indigenous plants, except the tomata, nasturtium, chickweed, dandelion, forget-me-not, Cape gooseberry, and some ferns and mosses. It is remarkable for the abundance of turtles (fig. 140) which frequent its shores. The Cape Verde Islands are by no means fertile: the Canaries, however, are of totally different character.

These isles, in olden time named Fortunate;
For friendly skies there so propitious shine,
'Twas deemed Earth gave her fruits uncultivate,
And luscious grapes adorned th' untended vine.*

These beautiful islands possess a peculiarly fine and healthy climate, and, during the greater portion of the year, the luxuriance and beauty of their vegetable productions is almost beyond description; but the Canaries are subject to the visitation of locusts, as also to the destructive effects of floods in the rainy season, and, at intervals, to earthquakes and volcanic eruptions. The peak of Teneriffe has been divided by De Humboldt into five zones, termed the region of vines, the region of laurels, the region of firs, the region of the spartium, or broom, and the region of grasses. The first zone extends from the level of the sea to 1200 or 1800 feet. In this region, with the vines, grow the euphorbias, mesembryanthemums, and many other tropical and African species; whilst the dragon's blood tree here attains an astonishing size, and appears almost to compete with the baobab tree in longevity. The second zone, that of the laurels, includes the splendid forest-trees which crown the hills adjoining the volcano; among which, we meet with an indigenous olive, a species of

* *Ed eran queste l'Isole felici, &c.*

TASSO, *Gerusalemme Liberata*, Canto 15.

oak, of chesnut, &c. The region of firs commences at the elevation of 5400 feet, and terminates at about 7200. To this succeeds the region of the spartium; after which is that of grasses. Beyond the region of the grasses, some lichens cover the arid soil, and tend to effect the decomposition, and consequent preparation of the volcanic matter, for the growth of other plants. The productions for which these islands are most remarkable are the Canary wine, and archil, or orchil (fig. 219), a species of cryptogamic plant, used in dyeing.*

Madeira unites the vegetation of Europe with that of Africa; but the euphorbias and mesembryanthemums, so characteristic of the latter region, are here wanting; and although the vine arrives at very great perfection, the other European fruits are said to be inferior in flavour even to those of Britain. The Azores, or Western Isles, sometimes included among the islands of Europe, are very fertile, more especially St. Michael's, celebrated for its oranges.

The African volcanic region is neither so continuous, nor so strikingly energetic, as some of the volcanic regions we have already considered.

Some volcanic rocks have been observed near Walvisch Bay, and also on the banks of the Nunez; but the principal volcanic group known to exist on the main land of Africa, occurs in the north-eastern districts. This volcanic formation appears to commence at Jebel Achmar, about three miles to the east of Kahirol, stretching from thence to Suez, and including in this part the craters of two extinct volcanos. Kahirol has occasionally suffered from earthquakes; one having occurred, as we have already seen, in 1754; and another on the 7th of August, 1847, when many of the mosques were injured and several persons killed. Both these convulsions extended to Alexandria. From Suez the volcanic formation extends in a south-eastward direction, the whole of the western

* The beautiful purple or crimson tint obtained from this plant (called also argol) is usually employed for colouring the liquid in spirit thermometers.

coast of the Red Sea presenting a soil of volcanic production, from Suez to the straits of Bab-el-mandeb. A volcano, in a state of activity, was observed in Saddle Island, one of the Zebayer group, in August 1846; and the little island in the straits is also volcanic, as are likewise the hills surrounding Aden. On the shores of Africa, opposite to the latter place, again, the vast desert which forms the country of Adel, is an upheaved volcanic formation, traversed in all directions by ranges of hills of moderate elevation, bearing the impress of subterranean fire. There are a great number of extinct volcanos in Adel, and the quantity of lava met with is prodigious, being in some places 130 to 140 feet thick. Hot springs, varying in temperature from 155° to the boiling point, are also very numerous in these districts; and at the distance of about fifty miles from Ankober there is an active volcano, from which smoke perpetually issues.

Nearly all the African islands are of volcanic origin, and many of them contain active volcanos, and also suffer from earthquakes. The principal group on the eastern side of Africa is that which includes Madagascar, and the islands of Mauritius and Bourbon. Madagascar contains an active volcano, to which the appellation of Radama has been given, in honour of the late enlightened chief of that name. Mauritius is volcanic; and Bourbon consists entirely of a mass of volcanic matter, forming two mountains, one containing an active volcano, which, for a long period, has regularly emitted lava on alternate years. This island also presents many indications of violent convulsive movements.*

On the western side of Africa, the rather distant island of Tristan d'Acanhua (which rises abruptly from the sea, in the form of a truncated cone) consists of an extinct volcano. St. Helena is also wholly of volcanic formation, and subject to earthquakes. The island of Ascension is chiefly of similar composition, and vast beds of scoræ and lava cover many parts of the island. Approaching nearer the mainland, we meet with the Isles de Los, which consist of a series of volcanic islands, some increasing, and others diminishing in size. Of

* The volcanic island of Amsterdam is too far removed to be included in this group.

similar formation are the islands in the Bight of Biafra, including Anna Bom and Prince's Island, the latter of which was so named from

The Lusitanian Prince,* who, Heaven inspired,
To love of useful glory roused mankind,
And in unbounded commerce mixed the world.

Proceeding northwards, we find the Cape Verde Islands, not only of volcanic formation, but containing, besides many other indications of energetic igneous agency, an active volcano in the island of Fogo, which, from the ashes which fell on a vessel, appears to have been in eruption in February, 1839. The whole group of the Canaries is volcanic; and in some parts of these beautiful islands, splendid basaltic cliffs rise perpendicularly from the sea to the height of 1500 or 2000 feet, whilst the peak of Teneriffe attains the elevation of 12,300 feet. The crater at the summit of this cone has, since it has been known to modern Europeans, ceased to emit lava, but is in the state of a solfatara;† and numerous eruptions have taken place from lateral openings in the mountains. And though no very recent eruptions appear to have occurred in the other islands, one of the most terrific description took place in Lancerote, which commenced in 1730, and lasted for above five years. The island of Madeira consists of one mass of basalt, and has also frequently suffered severely from earthquakes. It may, however, be questioned, whether both this and the Canaries, ought not rather to be included in the European volcanic region; unless, indeed, we may consider them as links, uniting the African and European volcanic chains.

* Henry, third son of John the First, king of Portugal, whose enterprising spirit greatly conduced to the improvement of modern navigation. He flourished in the beginning of the fifteenth century.

† A volcanic vent, from which sulphur, or sulphureous, watery, and acid vapours and gases are emitted, but which does not emit lava, or other solid products, is termed a solfatara.

CHAPTER XIX.

THE NEW WORLD.—GENERAL FEATURES OF NORTH AMERICA.—NORTH AMERICAN ISLANDS.

Say, who first passed the portals of the West,
 And the great secret of the deep possessed :
 Who first the standard of his faith unfurled
 On the dread confines of an unknown world.
 By Heaven designed
 To lift the veil that covered half mankind !—ROGERS.

THE form of the New World offers a strong contrast to that of the Old World, and instead of consisting of a vast extension from east to west, stretches from north to south, through 120 degrees of latitude. The principal range of mountains corresponds with the form of the continent, traversing it throughout its whole extent, and presenting by far the most continuous line of elevated land on the surface of the globe; the length of this mighty range, which, in some parts, contains summits of stupendous elevation, being little less than nine thousand miles.

The continent of America may be divided into three grand portions : North America, South America, and Central America.

One of the most important and striking features of North America consists of the vast range of mountains forming part of the grand central axis of the New World. These mountains were known to the early settlers as the Chippewayan Mountains; but from their broken and rugged character, and bare granite summits, they have received the name of the Rocky Mountains, or the Stony Mountains. This range runs parallel with the shores of the Pacific, from the Isthmus of Panama to the borders of the Arctic Ocean, where it terminates at no great distance from the mouth of Mackenzie's River. Many of the summits attain a considerable elevation, ranging from 12,000 to 14,000 feet. Fremont's Peak attains the height of

13,568 feet, Long's Peak about 12,500 feet, and Pike's Peak about 11,500 feet above the level of the sea. It is in the portion of the range where these peaks are situated, that the Colorado, Arkansas, and Missouri, as well as some other important rivers, take their rise. The Rocky Mountains, especially in their northern prolongation, are divided into several parallel ranges: and in one part no less than thirteen successive ridges are said to occur. These ridges are in some places intersected by elevated table-lands, and in others by deep and well-watered valleys; but the peaks of the mountains are generally bleak and bare; and in their higher parts they are covered with perpetual snow. These snow-capped summits present a brilliant appearance, from whence these mountains obtained, among some of the first observers, the appellation of the Shining Mountains.

The other principal mountain ranges of North America also take a general direction from north to south. Between the Rocky Mountains and the Pacific, a mountain range, in some parts connected with the central line, with which it runs nearly parallel, extends from the northern parts of the continent to the peninsula of Lower California, where it bears the name of the Californian Maritime Alps. The River Colombia, which takes its rise among the rugged summits of the Rocky Mountains, crosses this secondary range, where it forms some grand cataracts, and having passed between the lofty summits of Mount Hood and Mount St. Helens, pours its waters into the Pacific, after a course of a thousand miles.

In the eastern parts of North America, the Alleghany or Apalachian Mountains also extend in a northerly and southerly direction, stretching from Alabama and the northern confines of Georgia nearly to the banks of the St. Lawrence. These mountains are by no means so elevated as those of Western North America, the highest summits not much exceeding 6000 feet, and their general elevation ranging from 2000 to 3000 feet above the level of the sea.

The Lowlands of America form another striking feature in its natural geography. These extensive levels generally possess a sandy soil, and in some parts bear much resemblance to the steppes of Asia. They are naturally divided into three

portions ; namely, the Western Lowland, or the plains between the Rocky Mountains and the Pacific; the Central Lowland, comprising the vast plains through which the Mississippi flows ; and the Eastern Lowland, consisting of the comparatively narrow plains lying between the Alleghanies and the Atlantic.

The Western Lowland is in its northern portion of undulating character, and is described as being covered with one vast forest, from the sixtieth parallel of north latitude to the river Columbia. Beyond that river an open country prevails, varied by patches of trees of noble growth ; while still further south, the scenery is wild and rugged, some parts of the coast of Alta, or Upper California, called also New California, presenting by no means an inviting aspect, and consisting of tracts of glaring white sand, extending in an unbroken level for fifty or sixty miles, or of barren rocky mountain ridges, not of great elevation, but preventing all access to the shore. Some beautiful verdant valleys, however, intervene, marking the course of the streams which flow into the Pacific Ocean. The interior of this region, near the base of the Rocky Mountains, is occupied by a great salt plain seven hundred miles in length, and varying in width from one hundred to two hundred miles. Between this tract and the Pacific, the range of mountains called the Sierra Nevada extends, running nearly parallel with the coast, their declivities being beautifully but not densely wooded, and described as presenting a park-like appearance, " being planted by nature with a taste which art could not improve." The undergrowth consists chiefly of oats, which grow wild in this territory, the principal trees being oaks and pines—the acorns of the former, said to be little inferior to chesnuts, constituting the chief winter food of the native Indians. The soil of this part of California, when irrigated and cultivated, is very productive, and it is considered to be the finest wheat country in the world. The vine grows abundantly on the margins of some of the rivers in this region, producing small but well-tasted grapes, and, when cultivated in the valleys, it appears to attain to singular excellence, bearing " clusters of grapes weighing from four to five pounds, and rivalling in flavour the choicest growth of

Tuscany or the Rhine," and accordingly, being well adapted for the production of superior wine. The most remarkable feature of this country, however, consists in its mineral treasures, recent researches having disclosed its singular richness both in gold and mercury, the former being met with in extraordinary abundance in the sand and gravel of the streams, in the *gulches*, or ravines among the mountains, and even in the solid rocks of the Sierra Nevada. It is worthy of attention, that these mountains in their mineralogical structure bear a great resemblance to the Urals, which, as we have already seen, are also so productive in the precious metal; and here, as well as in Siberia, the gold is met with in *quartz* pebbles and sand, though in California apparently less exclusively in the detritus, rich veins having been discovered and traced for more than a mile in the solid quartz rock; and it is supposed that the Sierra Nevada may be pierced in every part by similar veins. The gold, when first extracted, appears of a dull yellow colour, but when it has been triturated and polished by the running water of the streams, or the mountain torrents in the gulches or gulleys, it assumes its characteristic glittering appearance, and the sand beds in some parts are literally sparkling with innumerable particles of the finest gold. One lump of pure unadulterated gold, weighing above five pounds, was found in the river Mokelumne. It is supposed that the amount of gold gathered from this productive metalliferous district up to the latter end of the year 1850, has not been less than thirteen millions sterling. The peninsula of Lower California possesses generally an arid soil, and the land capable of cultivation is very limited in extent; but it is noted for enjoying the most beautifully clear sky in the world.

The whole of Western North America possesses a milder climate than the central or eastern districts of the same continent, the winters being less severe, and the summers more temperate than in the latter districts; a particular instance of which has been already mentioned, in speaking of the mean temperature of Sitka. This difference of climate considerably affects the character of the vegetation in these different regions; and even in genera, the flora of Western America

differs much from that of the central and eastern districts, approaching nearer to that of Siberia.

In the northern parts of this region, near Prince William's Sound, though there is no forest, the vegetation is very luxuriant; and stunted spruces, rose bushes, and willows, form a dense mass, whilst the bases and declivities of the lower mountains, are rendered gay by the brilliant colours of the mimulus, lupine, and some other flowers. The predominant trees in the dense forest which occurs northward of the Columbia river are cypress trees, and some species of fir, accompanied by the willow, birch, wild cherry, sloe, service-berry, gooseberry, currant, raspberry, blackberry, strawberry, whortleberry, cranberry, &c. In the vicinity of the Columbia River, the pine attains a remarkable size, the most valuable species being the magnificent Douglas pine (fig. 143), the trunks of which tree vary in diameter from two to ten feet, and in height from 100 to 180 feet,* while the yet more lofty Californian pine reaches the height of 250 feet. It is a remarkable fact, mentioned by Mr. Hinde, that, at the banks of the Columbia, the fir suddenly disappears, and its place is supplied in the regions to the southward by the pine, which continues to occur on elevated land as far south as the vicinity of Panama. With the pine, we find the oak, plane, walnut, and broad-leaved maple (fig. 32), probably the finest of its genus, which yields a timber scarcely inferior in grain to the finest satin wood; while the under growth consists of arbutus, ribes sanguineum, lonicera, perennial lupine, clarkia, œnothera, escholtzia, and many other recently introduced ornaments of our flower gardens. In the more southern districts, the vegetation bears much resemblance to that of Mexico, the cactus family being very numerous as well as rich in variety, the most remarkable being a splendid species, which is described as rising in the form of a fluted column to the height of twelve or fifteen feet.

Among the animals of Western North America, we meet with the lynx (fig. 20), fox, wolf, black bear, grizzly bear

* This important species, which has only been known within a recent period, having been first observed by Mr. Douglas, appears likely to be successfully introduced into this country, the climate of which seems to suit it perfectly. Its growth is very rapid.

(fig. 28), wolverine, or glutton (fig. 31), fisher, pine marten (fig. 37), beaver (fig. 49), moose deer (fig. 85), carabou, or American reindeer, and some other species of deer; the cabree, or American antelope, Rocky Mountain sheep (fig. 103), and Rocky Mountain goat, remarkable for its long white hair, of a silky texture. Among the known birds, one of the most distinguished is the Californian vulture, which measures four feet, or four feet and a half in length.

The second great American Lowland, which is situated on the eastern side of the Rocky Mountains, and which forms the central basin of the continent, occupies much the largest portion of the whole surface of North America. In breadth it extends from the Alleghanies to the Rocky Mountains, and in length from the Gulf of Mexico to the Arctic Sea and Hudson's Bay, widening considerably in its northern portion. Over the whole of this great area no mountain ranges occur, nor any elevations beyond a few long ridges of hills. This plain consists of three vastly wide and regular slopes, determined by the course of the Mississippi. The first, which extends from the Alleghanies to that river, is in some degree diversified by hills, and embraces the most fertile territory of the United States. The second slope, which is more extensive and also more uniform, rises gradually from the Mississippi to the Rocky Mountains. A very considerable portion of this slope consists of sandy and bare prairies, whose surface, though gently undulated, "presents as few landmarks to guide the traveller on his way, as he would meet with in the middle of the ocean." A zone of about 200 miles in breadth is, however, well wooded; and in the more southern districts, the remarkable series of forests, known under the name of the Cross Timber, occurs. The latter belt of timber extends in a direct line from north to south, across the apparently interminable prairies of Northern Texas and the Ozark territory, to the southern bank of the Arkansas river. It varies in width from five to fifty miles; and in some parts is so straight and regular, that it appears like a work of art, and when viewed from the adjoining prairies on the east or west, has the appearance of an immense wall of woods, extending from north to south in a straight line, the extremities of which are lost

in the horizon. This remarkable belt "forms the great landmark of the western prairies; and the Indians and hunters," observes Mr. Kennedy, "when describing their routes across the country, refer to the Cross Timber, as the navigators of Europe refer to the meridian of Greenwich." The whole district lying on the Gulf of Mexico is low and swampy, and the coast of the Atlantic maintains a very similar character. The third slope extends northwards, from the sources of the Mississippi and the great Canadian lakes, to the Arctic Ocean and Hudson's Bay. The interior prairies of this region are, in their northern parts, destitute of trees, from whence they have acquired the name of the "barren grounds;" the southern districts, however, are well wooded, but the country bordering on Hudson's Bay is flat and swampy. The whole of this territory presents few elevated tracts, with the exception of a ridge which passes near the Great Slave Lake and Artillery Lake, and which appears to attain its greatest height near Sussex Lake, where it is supposed to be about 2000 feet above the sea. This ridge forms the water-shed, dividing the rivers which flow to the north and south.

To the eastward lie the territories of Upper and Lower Canada, Labrador, and Rupert's Land, which may be considered as a continuation of the Northern Lowlands of America; for, though some ranges of hills cross Canada, none occur of great elevation, and the surface of this extensive region is not much varied. Upper Canada, extending along the borders of the great lakes, is finely watered, and covered with immense forests of valuable timber. Lower Canada presents some very picturesque scenes, and notwithstanding its severe winters, nearly all the grains and many of the fruits grown in Britain, come to perfection; whilst, owing to the higher summer temperature, maize is capable of cultivation. The pastures of Canada are fine, though the favourite green crop is the *squash*, or gourd, with which the cattle are fed. Nova Scotia, and New Brunswick are well wooded countries, many parts still consisting of unbroken magnificent forests. The winters, owing to the more insular situation of these lands, are less severe than in Canada, but fogs prevail through the greater part of the year, rendering the summers less warm. Labrador

has all the characteristics of an arctic territory, being covered with forests of birch, pine, and fir, and filled with small frozen lakes. The climate of the large island of Newfoundland, compared with that of Britain, affords a striking illustration of the difference of temperature experienced in Western Europe, and in Eastern America. The soil of Newfoundland is rich, but the climate so unpropitious, that, though oats and barley, as well as potatoes, and the hardy European vegetables, succeed in the valleys, wheat will not ripen; and instead of the noble forests which adorn our island, stunted trees and low shrubs are generally met with, excepting in some sheltered situations at the heads of the bays, or on the borders of the rivers; and yet, the greater portion of this island is situated in a more southern latitude than any part of Britain.

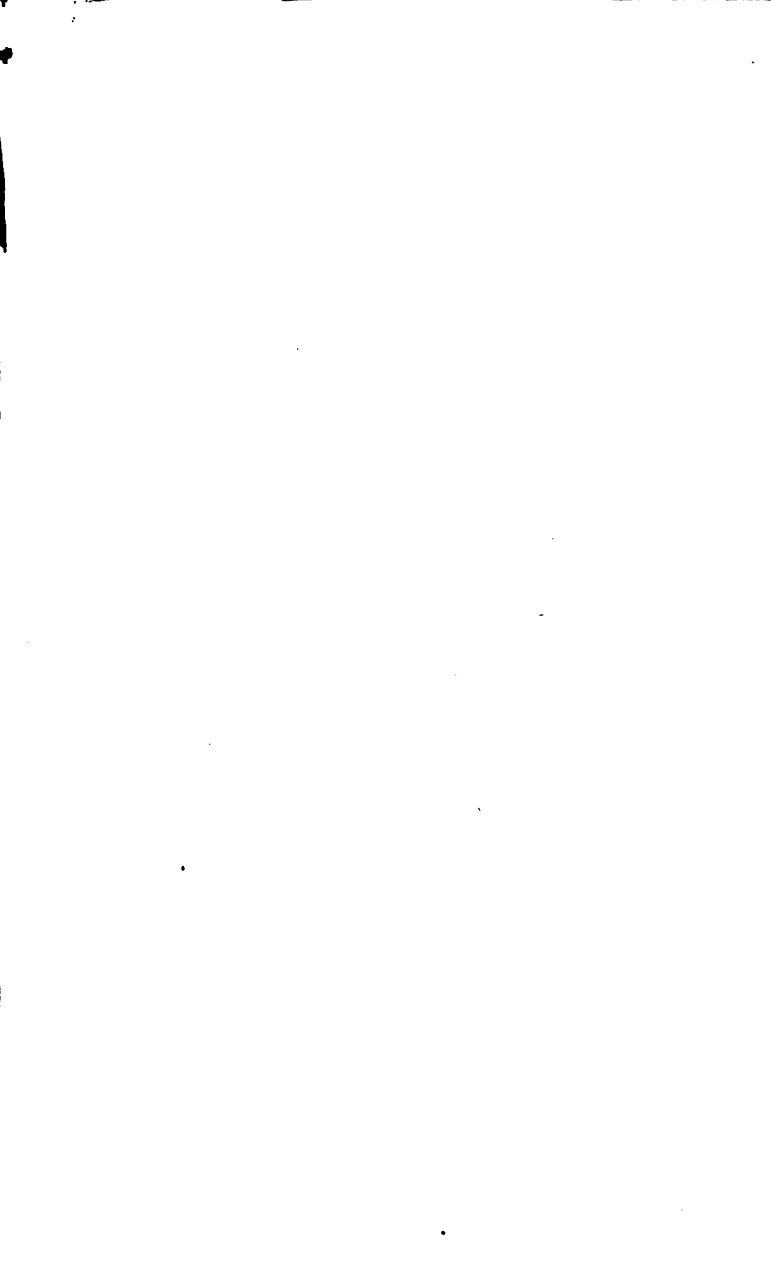
The third lowland of North America consists of the strip of country lying between the Alleghanies and the Atlantic, and extends from the eastern coast of Massachusetts to the Gulf of Mexico, losing itself at its south-western termination in the plain of the Mississippi. This tract, which in the New England States is very narrow, comprising the mere coast and islands, expands in its course southwards; the mountains in South Carolina being more than two hundred miles from the sea. It may be considered as forming two distinct portions, being divided nearly through its whole length by a well-marked geographical, as well as geological, boundary, consisting of a range of primary stratified rocks, which appear like a long line of cliffs, rising above the low, flat, and sandy plain, which extends from their base to the Atlantic. Below this rocky boundary, the aspect of the region is flat and monotonous, the general average elevation of the plain probably not exceeding 100 feet above the sea; and its average width through the Middle and Southern States being from 100 to 150 miles. The line of this dividing ledge is marked out by the rapids and cataracts (among which is the Fall of the Passaic) in nearly all the rivers between New York and the Mississippi, their waters precipitating themselves over these rocks, which, in a considerable extent of country, form the limit of the rising of the tide; whilst the advantages presented by the "water power," has caused this



Fall of the Passaic at Patterson.

boundary to be selected for the site of numerous cities and towns, such as Baltimore, Wilmington, Philadelphia, Patterson, &c. The upper tract possesses a very variable width, ascending with an undulating hilly surface, to a mean elevation of about 500 or 600 feet above the level of the sea, and swelling into bolder forms as it approaches the foot of the Blue ridge, or first range of the Alleghanies. This fine tract includes some very rich and fertile valleys.

North America contains many valuable mineral deposits. Coal occurs in great abundance in various parts of British America, as well as in the United States; a coal-field, 1500 miles in length, and 600 in breadth, being situated between the Alleghanies and the Mississippi. Salt springs are numerous in several parts of the United States; sometimes flowing naturally, as in the Arkansas territory, where the ground is covered with an efflorescence of salt. Some of these salt springs occur in marshy situations; and from having been the resort of deer, and other wild animals, to *lick* the earth impregnated with salt, they have been called *salt-licks*. Gold occurs in North Carolina; and silver, in small quantities, in some parts of the United States. Copper has been found





Weymouth Pine.—*Pinus strobus*.

both in British America and in the United States. Lead also occurs in great abundance in the latter territory, and in some other parts of America. The more universal and valuable mineral, iron, is diffused over many parts of this continent: and a remarkable mass of meteoric iron, weighing 3000 lbs., has been met with in Louisiana. Beryl, garnet, sapphire, tourmaline, amethyst, &c., occur in some parts both of British America and the United States.

The vegetable productions of the western lowland of North America have been in some measure described. The whole region to the eastward of the Rocky Mountains may be considered under one head. Vast forests once covered a large portion of its surface, though they are now fast falling under the axe of the settler. Among the trees of which they are composed, oaks are very numerous, and their range extends from Canada to the extreme southern parts of the United States, varying, however, in height, from two feet, to trees of the most stately dimensions. The scarlet oak, whose foliage changes in autumn to "scarlet honours bright," adds much to the beauty of the scenery at that season; whilst the tulip-tree (fig. 5), another ornament of this region, and which attains the height of eighty feet, assumes a garb of the brightest yellow. The white elm ranks among the most graceful and majestic of American forest trees; and the elegant American locust-tree (fig. 67), commonly known with us as the acacia-tree, though in this country of little value, grows to a splendid size, and forms an important timber tree in its native soil. Here also we meet with the ash, and various species of maple, including the sugar maple (fig. 30), from the abundant saccharine sap of which, no less than nine million pounds of valuable sugar are said to be annually made in the northern part of the United States. Walnut trees are very abundant in this region, and among these are the Illinois nut (fig. 102), much prized for its delicious kernel, the black walnut (fig. 103), and the hiccory (fig. 104). The Hudson's Bay poplar (fig. 110), American plane (fig. 114), and arbor vitæ (fig. 159), are also natives of this region. The fir tribe are likewise very numerous and varied, and include the swamp pine (fig. 146), gray, or scrub pine (fig. 147), black spruce

(fig. 150), Canada balsam fir (fig. 151), hemlock spruce (fig. 152), and the important Weymouth pine (the white pine of commerce), which, from its size, straightness of growth, and numerous valuable qualities, is particularly adapted for masts of ships, as well as many other purposes.

The vegetation of the southern portion of this region assumes much of a tropical character, as is shown by the occurrence of the bromelia, tillandsia, sapindus, &c.; and also of palm trees, especially the *chamærops palmetto*, which extends its range on the coast of the Atlantic as far north as latitude 35°. This palm grows to the height of forty or fifty feet, and the wood is in request for wharfs, and other submerged buildings, as it is not attacked by worms. Rhododendrons, azaleas, kalmias, and magnolias in the form of trees, are also abundant, extending to about the same parallel of latitude. From thence, to about latitude 50°, this region is remarkable for the preponderance of asters and solidagos; whilst in the more northern parts, the saxifrages abound. Among the latter is the *Saxifraga flagillaris*, the long runners of which, radiating from a central stem, give it a curious and spider-like appearance, from whence it has obtained among our sailors the name of the spider plant.

In these high latitudes the oak disappears; but the banks of the rivers are in some parts fringed with fir trees and willows, and the latter appears among the last trees on the islands of the northern lakes. The wild rose is also conspicuous on all the streams; and whortleberries, cranberries, &c. are in great abundance. The more northerly regions produce a species of lichen, to which the name of *tripe de roche* has



Tripe de Roche.

been given. This lichen is extensively used by the Canadian hunters as an article of food, and during one of the exploring expeditions to these inhospitable regions, undertaken a few years since by some of our enterprising countrymen, formed, for many days, their sole means of sustenance. Wretched as this diet may appear, the value of the plant must be regarded as great in a climate where other alimentary vegetables are unknown; and it is a circumstance which cannot fail to excite our admiration of the providing care of the wise and beneficent Author of Nature, that the various species of lichen and other cryptogamic plants which are capable of thriving in cold climates, are more adapted to afford nourishment to man, than those of similar genera growing in countries where the more nutritive vegetables abound. Various species of fungi, also, which are highly noxious, if not absolutely poisonous, when met with in temperate regions, appear to lose their pernicious qualities in cold climates, where they are even eagerly sought for as articles of food.

Among the cultivated vegetables, oats and rye are grown in the northern parts of the agricultural districts; wheat and maize (fig. 203) in the southern parts, of which the latter appears to be a native. Vast quantities of rice are grown in the moist districts of the same region. The introduction of the latter valuable grain into Carolina appears to have been wholly accidental: a ship, on its return from the East Indies, was cast away on these shores, and some bags of rice being found among its stores, a trial was made of sowing it; when it succeeded beyond all expectation, producing a grain more esteemed for many culinary purposes, than that grown in its native regions. The cotton plant (fig. 37), also a native of the East, is likewise extensively cultivated in the Carolinas and Georgia; and the cotton produced on the coast in this region, and called "Sea Islands cotton," is considered some of the finest in the world. Tobacco (fig. 136) is raised in greater quantities in Maryland and Virginia than in any other part of the globe; whilst in the warm districts of Florida and Louisiana, the sugar-cane (fig. 201) is successfully cultivated.

We have before remarked, that the zoology of the New

World is distinct from that of the Old, with the exception, however, of the Arctic regions, where similar species occur in both continents : among which we enumerated the polar bear, arctic fox, wolverine, &c., and some species of birds. The fauna of the lands bordering on the Arctic regions in America, is found to bear a general resemblance to that of the Old World, in similar parallels ; but though the genera agree, the species are mostly different. Among the larger animals in this part of America, are the black bear, grizzly bear, barren-ground bear, wolf, bison (fig. 97), musk ox (fig. 98), moose deer, wapiti deer (fig. 86), American reindeer, and prong-horned antelope. The lesser animals, which comprise the greater number of the fur-bearing animals, include the fox, otter, racoon, badger, ermine, wolverine, beaver, &c., besides various species of marmots and squirrels, among which is the gray squirrel (fig. 52), which is particularly abundant in Carolina and Pennsylvania. The radiated mole (fig. 10), and the Virginian opossum (fig. 48), inhabit the more southern districts, the latter extending its range westward to California.

The short duration of summer within the Arctic circle,—the temperature being already on the decline, before the country is even partially cleared of its snowy mantle,—might lead us to suppose that no granivorous (or grain-eating) birds, could find a supply of food in such high latitudes. But, by an admirable provision of the beneficent Creator, the very peculiarity of this severe climate tends to furnish the snow-buntings and finches with food, at a season when the patches of ground cleared from snow are scarcely larger than will suffice for the reception of their eggs. This is effected by the rapidity with which the frost sets in, owing to which the process of vegetation is suddenly arrested ; and the grass culms, instead of dying off and withering, as they do in more temperate latitudes, are preserved full of sap until the spring, the seeds also remaining firmly fixed in their receptacles until that period. As soon, however, as the ground is prepared by the melting of the snow for the reception of these seeds, they are cast to the earth ; and in a few days a brilliant, though short-lived, verdure gladdens the eye. These grass-seeds, and various berries, such as those of the cranberry, &c., form the

food of the finches and other birds on their first arrival; and, no sooner does the snow begin to thaw, and a surface spread over the ice of the smaller lakes, than the larvæ of gnats and other insects swarm in myriads, affording abundant supplies of suitable food for the young birds as soon as they are hatched. Other birds, such as the ptarmigan, feed on the catkins of the dwarf birch and willow, and may therefore obtain their food, even amidst the snow. These, and other capabilities, cause a large number of birds to migrate to these northerly regions, yielding, in their turn, a supply of food to the human inhabitants of those barren and desolate lands.

The passenger pigeons, whose migrations, in such immense bodies as actually to obscure the light of day, render them an object of interest, feed chiefly on beech masts, and their migrations appear, in great measure, dependent on the abundance of that food. They migrate northwards towards the end of summer, as far as the 62nd parallel; and return southwards when the supplies fail them in those parts. Among the other birds of North America are the Virginian owl (fig. 118), the mocking bird, and innumerable flocks of warblers, fly-catchers, starlings, thrushes, woodpeckers, &c., keeping the noxious insects within due bounds, and making the woods resound with their notes. The turkey (fig. 124) is a native of these regions, and is still found wild in the woods.

The islands of North America are, from their high latitude, subject to great severity of climate, and their animal and vegetable productions are limited in number. Southampton Island, situated at the entrance of Hudson's Bay, presents a dreary appearance; the land being high and irregular, and the whole face of the country consisting of little else than rounded blocks of granite: the only trees are a few miserably-stunted willows; the only animals observed by Captain Back were a brace of ptarmigans. The Georgian Islands possess an equally rigorous climate. Melville Island, the most westerly of the group, although it appears to be nearly destitute of animal and vegetable productions, possesses, in its limited flora, some species not found elsewhere. Sir Edward Parry, during his stay in this region, met with no

other animals than a few ptarmigans in the summer, and a pack of hungry wolves in the winter. A succession of islands, included in the same group, extends eastward from Melville Island, all bearing a similar Arctic character.

The remarkable substance, to which the appellation of "red snow" has been given, occurs abundantly in the islands of North America. This substance, until very lately, was considered to be a cryptogamic plant; but recent investigations have led to the conclusion that it belongs to the animal, instead of the vegetable kingdom; and that it consists of an accumulation of the ova of a minute animal. In such vast quantities does this substance occur in these high northern latitudes, that in some parts the snow has been found tinged with it to the depth of twelve feet, and the surface covered with it for several miles.

Greenland, although its actual limits have not hitherto been ascertained, is evidently a territory of vast extent. Its aspect is very dreary, especially on the eastern coast, which is described as consisting, in most parts, of one almost uninterrupted glacier, varied only by a few patches of vegetation, principally occurring on the banks of the rivers, which, in their course to the ocean, dissolve the ice in their immediate vicinity. A mountain range skirts the shores in this part, forming bold and precipitous cliffs, and rising in the interior into numberless peaks and cones, ranging from 2000 to 3000 feet in height; but the portion of the range known as the Werner Mountains attains the elevation of 6000 feet above the sea. These shores are deeply indented by bays and inlets. The south-western coast of Greenland, though apparently the most favoured portion of this arctic region, presents little to adapt it for the abode of civilized man. In this district, the only trees, if trees they can be called, consist of some low bushes of birch and willow, which never exceed two feet in height. A fine grass springs up in some parts, but withers quickly when exposed to the warmth of the sun. Besides these plants, the vegetation chiefly consists of some species of cochlearia, sorrel, and a few other similar plants, adapted to thrive in alpine regions, or in high latitudes. The insects of Greenland, as we have already remarked, are

likewise similar to those of the Old World. The larger animals consist only of the most northern species; and the seas abound in marine mammalia, which form the principal food of the natives.

CHAPTER XX.

GENERAL FEATURES OF SOUTH AMERICA. — SOUTH SHETLAND.

Where the roots of the Andes
Strike deep in the earth,
As their summits to heaven
Shoot soaringly forth.—BYRON.

TWO remarkable features characterize the vast peninsula of South America:—the colossal range of mountains which traverse it from north to south; and the almost boundless plains, which occupy so large a portion of its eastern surface.

The Andes, called also the *Cordilleras*, or *Chains* of the Andes, present a mighty unbroken range of elevated summits, rising, like a vast wall, on the western side of the continent, parallel to, and at no great distance from, the Pacific Ocean, and extending from the dreary regions of Tierra del Fuego, to the most northern boundaries of South America: being also remarkable for the numerous active volcanos, and the prodigious volcanic agency exhibited in nearly their whole course.

Tierra del Fuego consists of a group of islands of mountainous character, intersected by narrow and deep arms of the sea. The summits of these islands are crowned with perpetual snow; but their steep and rocky shores are in great part covered with evergreen woods, consisting chiefly of a species of evergreen beech, and of the Winter's bark (fig. 6), both of which thrive in the sheltered parts of these islands, as far as 2000 feet above the sea-level. The line of perpetual snow descends considerably lower in this region than in parallel

northern latitudes; and yet vegetation appears to thrive so luxuriantly, that on these shores the fuschia and veronica, which in our climate rank as tender plants, not only flourish in the open air, but attain the size of woody-stemmed trees, the stems being five or six inches in diameter: and they were observed by Captain King, in full flower, at the temperature of 36° , and growing at the base of a mountain, two-thirds of which was covered with snow. This circumstance has been attributed to the superior clearness of the atmosphere in this region. The parrot and humming bird extend their range to the Straits of Magelhaen; the former in quest of the seeds of the Winter's bark, whilst the humming bird sips the honey from the blossoms of the fuschia, and has even been observed fluttering about in the midst of a snow shower.

In their more southern parts, the Andes are not remarkable for their altitude; the average height being about 3000 feet, and the most elevated summit that has been measured to the south of the island of Chiloe, not exceeding 9000 feet above the sea. In this part, which may be distinguished as Western Patagonia, the mountains border closely on the ocean, the waters reaching to their very base, and forming numerous inlets, resembling, though on a larger scale, the fiords of Norway; and the whole of the region off this coast presents the appearance of the upper portion of a mountain range, the base of which is immersed in the ocean, whilst its summits form multitudes of islands. These islands are barren to seaward, but towards the mainland they are clothed with impenetrable woods; there are very few acres capable of cultivation in the whole district; no place fit for the permanent abode of civilized man. The large island of Chiloe is fertile, but like this portion of the coast, exposed, as we have already seen, to an excessive amount of wind and rain.

In the territory of Chili, the Andes do not border so closely on the ocean, between which and their base a belt of land occurs, varying in fertility, and becoming gradually less productive as it approaches the equator. Thus, the country in the vicinity of Concepcion is covered with the richest and most luxuriant foliage; near Valparaiso, the hills are thinly clad with stunted brushwood and a sprinkling of grass, the

ground generally looking poor and bare ; whilst near Coquimbo the brushwood disappears, and nothing is met with but the cactus, and a few blades of gray or purple wiry grass, excepting, indeed, during the rainy season, when beautiful annuals spring up : further northwards, all traces of vegetation cease, and sand-hills and plains alone are seen, unless, perhaps, in a few spots, where some stream of water, caused by the melting of the snow on the Andes, may fertilize the channel through which it takes its course.

The Andes, in this part, occasionally rise abruptly from the plains, with nearly perpendicular walls of sienite, 1000 feet in height. In those parts where the acclivities are less steep, the lower portion of the range is covered with lofty forest trees, which gradually diminish in size at increasing elevations, until they wholly disappear, and nothing but bare rocky masses are seen, or summits covered with perpetual snow. In the more northern parts of Chili, the mountains rarely reach the line of perpetual snow ; this difference is not, however, attributable to their inferior altitude in those districts, but to their greater proximity to the equator, and the consequent greater elevation of the snow line.

The mineral productions of Chili are valuable and abundant. Gold, silver, and copper, are met with in various parts ; and a vast deposit of excellent coal has been discovered near Concepcion. Rock salt is also abundant.

The southern districts of Chili are prolific in timber trees. The noble *araucaria*, or Chili pine (fig. 158), is almost exclusively confined to the territory still occupied by the yet unconquered tribe of the Araucarians. The myrtle grows to a large size in Southern Chili, producing useful timber. In the more northern and less productive parts, large trees occur only in the quebradas, or ravines ; and the numerous cacti (figs. 21, 22), constitute the principal vegetation. This region may be considered as the native country of that valuable, and now widely diffused plant, the potato (fig. 135), which is very commonly found growing wild near Valparaiso, inhabiting steep rocky places on the cliffs near the sea, and always bearing pure white blossoms, free from the purple hue so frequent in the cultivated varieties.

The wild animals of Chili, and, indeed, of the whole narrow belt of land situated between the Andes and the Pacific, are not numerous. The most remarkable quadrupeds are the different species of llama, which inhabit the slopes of the mountains, and the chinchilla (fig. 51), which may be considered as supplying the place of the rabbit, and which occupies the higher parts of the mountain range. Among the birds, we meet with the condor (fig. 114), one of the largest of terrestrial birds, peculiar to the Andes, where it selects the highest eminences below the line of perpetual snow, extending its range from the vicinity of the equator to the Straits of Magelhaen, and at times assembling in flocks, and committing great ravages, not only among the wild llamas on the mountain slopes, but also among the cattle and sheep in the plains. Another remarkable bird, inhabiting Chili, is the plant cutter, whose bill is toothed like a saw, and employed in a manner similar to that instrument, for cutting off small branches of trees, thus enabling the bird to obtain the tender green leaves on which it feeds. A large species of humming bird, nearly four times the size of any previously known, has been observed in Chili, and has been named the Patagonian, or giant humming bird.

The grand central range of the Andes, which, from the southern extremity of the continent to the borders of Bolivia, has formed one undivided ridge, separates near Potosi into two mighty parallel ranges, called the Eastern, or Bolivian Cordillera, and the Cordillera of the Coast. The Eastern, or Bolivian Cordillera, which may be considered as the more marked continuation of the grand range, does not, in its first portion, attain any very remarkable elevation; the average height of the summits being about 16,000 feet above the sea level. It consists of a metalliferous group, to which the celebrated mountain of Potosi belongs. In its northward prolongation, however, we meet with some of the most elevated summits in the whole range of the Andes. In this part, the gigantic Illimani rises abruptly to the height of 21,145 feet, far above the line of perpetual snow, which, in this parallel of latitude, reaches the height of about 17,000 feet. The colossal Illimani is succeeded by an almost continuous line of

nevadas, or snow-capped summits, the most elevated of which is the nevada de Sorata, 21,286 feet above the level of the sea.

The Western Cordillera, or Cordillera of the Coast, is also of considerable, though not of equal elevation. Its highest summits all consist either of active volcanos, or of mountains of igneous origin. Many of their summits rise above the line of perpetual snow; and among these are the active volcano of Gualatieri, and the colossal dome-shaped Chuquibamba, which latter bears the appearance of having been formed of one simultaneously uplifted gigantic mass of trachyte, that has apparently pierced through, and rests upon, a stratum of red sandstone.

These vast ranges, which again unite in the Andes of Valcanata and Cusco, enclose the high table-land or valley of Desaguerado, and the elevated lake of Puno, or Titicaca. This lake is studded with numerous islands, from the largest of which the lake obtains its name.*

The Andes, so colossal in this portion of the continent, at this point also send forth, on their eastern side, numerous lateral branches of vast magnitude, among which one of the most conspicuous is that on which the city of Cochabamba is situated, and which includes several snow-capped summits. These lateral branches, and their collateral spurs, give a mountainous and hilly character to this portion of Bolivia, where numerous beautiful valleys occur, possessing a delightful climate and highly fertile soil.

Western Bolivia, or the tract lying between this portion of the Andes and the Pacific, is almost destitute of vegetation. In some parts the cactus is the only plant that succeeds; whilst in others, no plant, no bird, no insect whatever, is seen.

The group of Cusco, which forms the continuation of the central line in Peru Proper, is not remarkable for its elevation. The mountains of Pasco contain some snow-clad summits, and enclose a valley or basin, 11,000 feet above the sea. The Andes, to the north of Pasco, divide into three parallel ridges, the most westerly of which alone contains any peaks rising

* This island contains many Peruvian ruins; and the whole locality is considered to have been the earliest scene of Peruvian civilization.

above the limits of perpetual snow; and from this point to Chimborazo, a distance of 400 miles, no summits occur attaining that elevation.

The mineral treasures of Peru, with which those of the Bolivian Andes may be included, have long been celebrated. Tin and lead mines occur, as also considerable deposits of copper, and beds of ironstone; but the most remarkable are the vast stores of gold, silver, and cinnabar (the common ore of mercury). The most noted mines are those of Lauricocha, or Pasco, in Peru Proper, and those of Potosi, in the Bolivian Andes, both of which are situated at great elevations. The silver mountain of Potosi, which is 16,000 feet above the sea, has no equal in the world. This vast deposit is eighteen miles in circumference, and forms one entire mass of ore, displaying on its surface all the varied metallic tints, of green, orange, yellow, grey, and rose colour. It was discovered in 1546, and from that period to the present time, the amount of silver extracted is almost incredible, and yet the supply still appears inexhaustible.*

The whole western coast of Peru, like the northern part of Chili, is a complete desert, intersected only occasionally by a quebrada, in which vegetation is, however, remarkably luxuriant. Rain is unknown in Peru; but the climate, tempered as it is by the sea-breezes, is described as very delightful, especially in the narrow valleys, where almost every species of grain comes to perfection; the climate permitting both planting and reaping on every day in the year. The transition from the sterility of the desert regions to these fertile quebradas, or valleys, is very striking. The trees, however, even in these spots, are not numerous, and consist chiefly of willows and a species of acacia. The zoology of Peru is little known: the llama (fig. 82) inhabits the Andes, and this animal is here trained to carry burdens. A species of tapir, totally different from that met with in the plains, also frequents these mountains; the body of this animal is entirely covered with long hair, of blackish-brown colour, it being thus adapted to

* The sacrifice of human life in the prosecution of the search for these treasures has been excessive: it is said that no less than sixteen extensive provinces have been depopulated in this cause.

inhabit the cold regions which form its station.* Peru contains a very small number of birds, and no noxious reptiles.

The Colombian Andes commence with the group of Loxa, where the three parallel ridges again unite. This district is the native region of the most esteemed species of quinquina, or Peruvian bark (fig. 129), this particular species having been only met with near Loxa, and in a small district in Peru. This tree grows at the elevation of from 11,000 to 15,000 feet above the sea. Beyond Loxa, the Andes once more divide into two ridges; and in the eastern or inward Cordillera we meet with the gigantic Chimborazo, whose dome-shaped summit, which attains the altitude of 21,415 feet above the sea, was long considered the most elevated point on the surface of the globe, though it is now known that this mountain is surpassed in elevation by many other peaks, both in the Andes and in the Himalaya Mountains. The western or maritime division of this portion of the Andes contains the splendid cone of Cotopaxi.

The two lines next unite in the narrow ridge of Chisinchá, but ere long branch off into two ranges, between which is situated the elevated table land of Quito.† This extensive plain, notwithstanding its equatorial situation, enjoys a singularly mild and delightful climate, the heat being tempered by its elevation of about 9000 feet above the sea, whilst at the same time it possesses the advantages imparted by an intertropical situation. Vegetation here never ceases, and such is the verdure of the meadows and trees, that it has acquired the name of "the Evergreen Quito." All the productions of temperate climates succeed in this plateau, and the cerealia, which will not thrive in the low plains, here arrive at great perfection. The introduction of wheat is, according to De Humboldt, traced to three or four grains, which a negro servant of Cortez picked out among the stores of rice, sent from Europe for the supply of the troops. These grains were sown in the garden of the monastery of Quito; and the earthen vessel in which the first crop was gathered

* This hairy tapir cannot but remind the geologist of the hairy mammoth and hairy rhinoceros of the Later Tertiary Period.

† Quito is now called the department of the Equator, on account of that line passing through this territory.

was, at the period of De Humboldt's visit, still preserved as a precious relic by the monks of that place. The mountains which surround Quito include a vast assemblage of snow-clad summits, no less than eleven *nevadas* being visible from that plain; among which, in the Eastern Cordillera, we meet with the volcanic cones of Cayambe and Antisana; and in the Western Cordillera, with that of Pichincha.

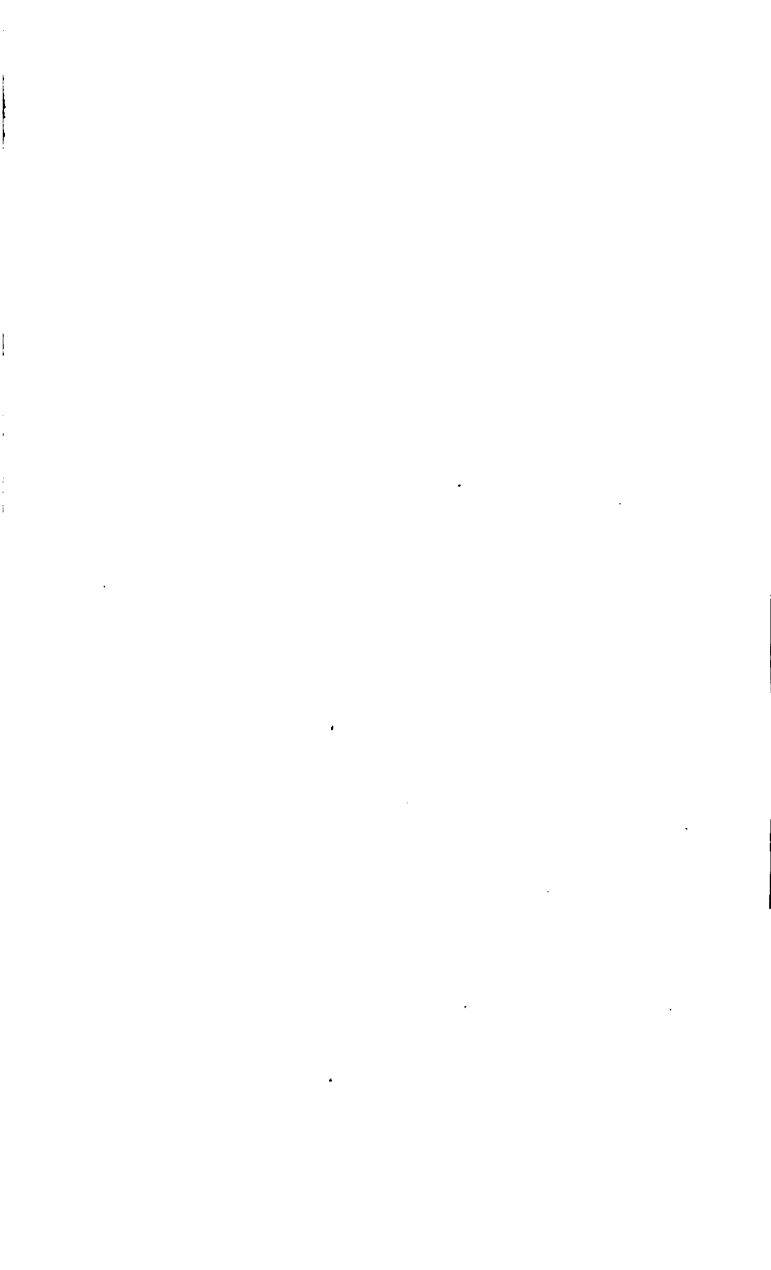
To the north of this magnificent group, the Andes again unite into one undivided range, following the line of the coast until they approach the city of Almaguez, at which point three vast ranges diverge from the central line, with which they do not again unite.

"Among the majestic scenery of the Andes," observes De Humboldt, "the *valleys* most powerfully affect the imagination of the European traveller. The stupendous mountains can only be seen from the low islands on the sea-coast, at a great distance from the main chain. The elevated plains from which the detached summits of the mountains rise are, for the most part, from 8000 to 10,000 feet above the level of the sea. This circumstance, in some degree, lessens the effect produced by the colossal masses of Chimborazo and Cotopaxi, viewed from the lofty plains of Riobamba and Quito." The valleys intersecting these mighty mountains are equally remarkable for the wildness and terrific character of their scenery, as for their great depth. The valley of Chota is nearly 5000 feet in perpendicular depth, and so precipitous are its sides, that it may be considered rather as a ravine than a valley. The valley of Icononzo is of much smaller dimensions: but on account of its two remarkable natural bridges, is regarded as an object of great interest. The depth of the crevice (through which a torrent gushes, forming two cascades) is nearly 320 feet, and its width 48 feet. Across this crevice extend these two natural bridges: the upper apparently consists of an undisturbed mass of rock, continuous with the strata forming the sides of the crevice; but the lower bridge consists of three enormous masses of rock, which have fallen down so as to meet in their descent and form an arch.

We now find the Andes divided into three ranges: the Western, Central, and Eastern Cordilleras. Of these the



Natural Bridge of Icononzo.



Western Cordillera may be considered as the prolongation of the Central Line. This portion of the Andes continues in an unbroken ridge, until it becomes depressed near the mouth of the river Atrato, which forms the line of demarcation between South and Central America. This Cordillera contains no very lofty summits; but the Central Cordillera is more elevated, and includes the Pic de Tolima, which is the most lofty peak met with in the Andes north of the Equator, being 18,314 feet above the sea. The Eastern Cordillera extends towards Santa Fé de Bogota, which is situated on a plain 8700 feet above the level of the sea. The mountain system of the Andes is considered to terminate in this Cordillera, with the elevated Sierra de Merida. An extensive diverging branch, however, (to which we shall have occasion again to revert), stretches along the northern coast of Colombia.

The vegetation of intertropical America is equally splendid, rich, and varied. Owing to the vast undulations of its surface, the plants of hot, of temperate, and of arctic climates occur within a limited portion of territory; and this region affords a most striking illustration of the range of various plants at different elevations above the level of the ocean.

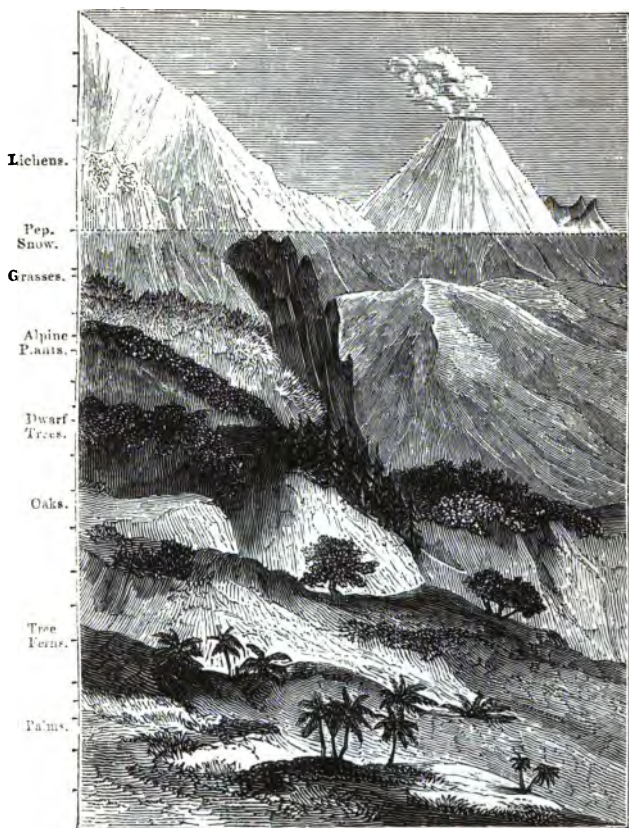
The vegetation under the equator has been divided into six zones: the first is that of the *palms*, which extends from the level of the sea to the elevation of 3600 feet. In this zone, with the various palms, grow the banana or plantain, the cacao or chocolate tree, the liliaceous plants, &c. The second zone is that of the *arborescent* or *tree-ferns*, and *quinquinas*. The arborescent ferns range between 1300 and 5000 feet,* but the quinquinas extend much higher. With the tree ferns grow the sensitive mimosas, the arborescent passion flowers (said to equal British forest trees in size), the large blue-flowered melastoma, and a vast variety of splendid and beautiful flowering plants. The third region is that of the *deciduous oak*, which terminates at 9000 feet. This tree appears to be

* In Hawaii, however, although that island is situated nineteen degrees north of the equator, the arborescent fern grows at a much greater elevation, extending on Mowna Koah to 8700 feet above the sea; thus affording a striking instance of the influence of an insular climate on this plant, and of its adaptation to thrive in higher latitudes in such situations: a fact of considerable interest to the geologist.

the only plant which loses its foliage in this region of perpetual vegetation. It is, however, on this account peculiarly gratifying to the eye of the European traveller, the tender green of its early leaves affording him a reminiscence of the spring of his native plains. In this zone we still meet with splendid passion flowers and melastomas; and the wax-coated palm accompanies the oak to its furthest limits. The wax-palm, which frequently grows to the height of 180 feet, has its trunk thickly coated with wax, from whence its name. Beyond 9000 feet, the larger trees disappear; and the zone of *shrubs* and dwarf-pines extends to 11,500 feet, and in a few favourable situations, to 13,000; the ground in this part being richly adorned with lobelias and golden calceolarias. The fifth zone is that of *alpine plants*, which make their first appearance at about 6000 feet, and extend to 13,000 feet. These include the gentians, and ranunculuses, &c. The *grasses* and *herbaceous plants* succeed, and these in their turn disappear at 15,000 feet, after which *lichens* alone clothe the rocks; though some of the latter extend to the elevation of 18,000 feet, growing even beyond the limits of perpetual snow.

The mountain range of Venezuela, or Caraccas, which branches off from the Andes at the Sierra de Merida, extends along the coast of Caraccas, running parallel with the sea for five hundred miles, and terminating near the Gulf of Paria, in the mountainous island of Trinidad, which is considered as belonging to this range. The mountains of Venezuela consist of a series of ridges of moderate elevation, enclosing numerous fertile valleys; and in this region a very rich gold district has recently been discovered. Between the mountains and the sea a narrow low plain occurs, abounding in the most valuable tropical productions, but in many parts swampy, and swarming with myriads of tormenting insects.

In the calcareous mountains near Cumana, is situated the extensive and celebrated cavern of Guachara, presenting splendid and beautiful specimens of stalactites, assuming the most varied and picturesque forms. This cavern is inhabited by countless numbers of a species of nocturnal bird, called the Guachara bird: this bird is not, however, peculiar to this



Scale of Vegetation

in Equinoctial America, according to the Elevation above the Sea,
with the Summits of Chimborazo and Cotopaxi. See p. 329.

Height of Scale, 22,000 Feet.

locality, also frequenting the crevices of the Andes. One of the most remarkable plants of this region is the palo de vaca, or cow-tree (fig. 98). This tree grows luxuriantly in the more elevated valleys of Venezuela, the stem rising up majestically to the height of at least sixty feet, and being crowned with a noble head not less than forty feet in height. The leaves resemble those of the laurel, but are twelve or sixteen inches in length. When a deep incision is made in the bark, a white stream bursts forth, "in colour and consistence," says Sir R. K. Porter, "in no degree differing from the milk of the cow; in taste, not less sweet and palatable; leaving, however, on the tongue a slight bitterness, and on the lips a disagreeable clamminess."

To the south of the Venezuela range commence the vast plains of South America,

Where blue savannahs melt into the sky,
And forests frown in midnight majesty.

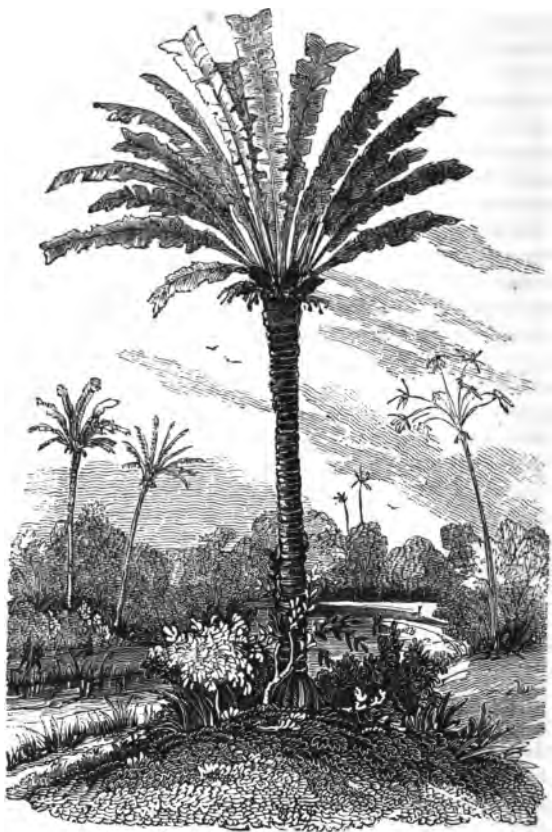
These immense plains, called in the native language *pampas*, and by the Spaniards *llanos*, both words signifying "levels," form one of the characteristic features of this portion of the New World. These "blue savannahs" are not, however, absolutely flat, but consist of undulating ground, and many parts are marshy; but, excepting on the borders of the rivers, they are usually destitute of trees; though a few stunted plants of the *curatella Americana*, the rough leaves of which are used by the Indians in polishing their arrows and war clubs, and some *malpighiæ*, the bark of which the Brazilians use in tanning, are dispersed over these plains; but in consequence of their almost equal size, and thinly scattered foliage, they do not contribute to lessen the monotonous aspect of the llanos, nor do they afford shelter to the weary traveller from the rays of the sun. During the dry season, these plains present in most parts the appearance of a parched desert; but after the rains, they are covered with grasses and sedges, the former of which afford food to numerous herds of cattle. In some parts, however, coppices, or groups of trees, occur; during the annual inundations appearing like little islands in the midst of the surrounding waters, and in the dry season rising like oases

out of the llanos, these more fertile spots being nourished and supplied with moisture during the latter season, by the abundant dews, which form such a characteristic feature among the meteorological phenomena of most intertropical countries. These oases seldom exceed two miles in circumference, but often contain trees of considerable size. In their vicinity, among the plants requiring little moisture, and adapted to bear the full action of the sun, grow the agave, and several erect and angular cacti: some of the latter appear in the form of huge candelabras, whilst others overtop in height the surrounding trees, and are adorned with flowers remarkable for their beauty, or with fruit of inviting appearance. Many of these plains are intersected by small rills of limpid water, the banks of these streams being usually bordered by the majestic mauritia or eta palm tree, and adorned by various beautiful flowers; and in some parts fringed with the *cynrium saccharoides*, a species of grass which attains the remarkable height of thirty-two feet.

Compared with the stupendous range of the Andes, the mountains of this portion of South America are not remarkable for their altitude; they are, however, of sufficient elevation to impart a mountainous character to some parts of this region, and to form the separation between the basins or lowlands of the Orinoco, the Esequibo, and the Amazonas; and the limits of these respective basins may be considered as definitely marked by the water-shed towards each of the great rivers by which they are traversed.

In British Guiana the most remarkable mountains are the magnificent and picturesque group, of which Roraima forms the most elevated summit. This mountain attains the height of 7500 feet above the sea, and its upper portion presents a remarkable mural precipice, 1500 feet in height. This mountain range abounds in cascades, which eventually form tributaries to the three important rivers, the Orinoco, the Esequibo, and the Amazonas. British Guiana was the El Dorado of Sir Walter Raleigh, the mountains having been described as resplendent with particles of the most precious metals. But

. The telescope of truth,
Which strips the distance of its phantasies,



Eta Palm.—*Mauritia Flexuosa*.

has dispelled this illusion, divested this region of gold of its imaginary metallic treasures, and revealed to us, that this supposed precious ore was nothing more valuable than the shining particles of mica, which occur in great abundance in the granite mountains. This region, indeed, appears in a remarkable degree to have been made the subject of fiction, or exaggeration; for a vast lake, stretching far into the interior, was supposed to exist in this locality, and accordingly figured for centuries on the maps of Guiana; but this mysterious lake has now altogether disappeared, or faded down into the extensive level plains, (bounded by the Carawaimi, Canacu, Pararaima, and Parima mountains,) which were probably visited whilst in their state of annual inundation.

But although this region may not be a land of metallic treasures, it affords a rich field to the botanist; the vegetation of Guiana being most varied and luxuriant. It abounds in valuable timber trees, and in many parts on the borders of the rivers, "the forest reigns triumphant," rising like a wall on each side of the stream; the outline being only occasionally varied by the inroads which the stream has made, undermining and laying prostrate many a lofty tree, possibly to be borne down to the sea, and carried by the currents of the ocean to Iceland, or to some other desolate shore, the exuberance of one region thus supplying the wants of another. Among the trees of Guiana, pre-eminently above all towers the majestic mora, which, according to Sir R. Schomburghk, is equal, if not superior, to the British oak for ship-building. The trunk of this tree often exceeds ninety feet in height, and its summit is occasionally crowned by an unusual parasite, the wild fig tree, which takes root in some of the topmost branches, deriving nourishment from the sap; whilst the latter plant is, in its turn, again overrun by some of the various gigantic creepers which are so abundant in these forests. Another important tree is the mauritia or eta palm, the lofty stem of which supports numerous fern-shaped leaves, and a gigantic cluster of round fruit or seeds. This fruit, which is said to taste like cheese, forms a principal article of food among the natives, as does also the pith of the trunk; and indeed, every part of the tree is valuable; the fibres of the

young leaves are woven into cordage, baskets, and hammocks ; the old leaves thatch the house, the trunk forms the walls and the floors, and the pith of the leaf, split up, makes a sail for the corial, or canoe.

Numerous other species of palm-trees are met with in this region ; among which is the *Attalea funifera*, or chique-chique palm (fig. 186), from which ropes are made. Here also we find the bombax, called also the silk cotton tree, or celiba ; the banana, from the fibres of which useful tree a substitute for flax is obtained : the *lecynthis*, the inner bark of which affords an excellent substitute for tow ; the *Bixa orellana*, from which the arnotte dye is procured ; the fragrant Tonquin bean ; the chocolate tree (fig. 36), which produces the cacao, or cocoa-nut of commerce ; the vanilla (fig. 171), quassia, &c. The swampy sea-coasts are occupied by mangroves, which on the banks of the rivers are replaced by the water guava. We cannot pause to consider all the splendid and beautiful flowering plants of this region ; but must not pass unnoticed the superb *Victoria regina*. This magnificent plant grows in still water, and has hitherto been principally found in the River Berbice. Its gigantic leaf, which rests upon the water, is from five to six feet in diameter ; the upper surface being of a bright green, and the under surface vivid crimson. The flower, which is fifteen inches in diameter, is at first of a pure white, with pink in the centre ; by degrees, however, this pink tint spreads over the flower, and on the following day it assumes a uniform pink colour. Orchideous plants and ferns are very abundant in Guiana ; and Sir R. Schomburgk mentions a curious cryptogamic plant, emitting a whitish phosphoric light, which, after long-continued rains, was observed in considerable abundance near his tent, covering the leaves and smaller branches of the trees, and quite illuminating the ground.

Among the native animals of this region, we meet with the howling monkey, the weeping monkey, and various other species of monkeys, the large vampire bat (fig. 7) ; the puma, jaguar, agouti, sloth, ant-bear, the armadillo, opossum, tapir (fig. 71), &c. The birds are very varied and beautiful, and include the splendid orange-coloured rock manakin, the bell-bird, various parrots and humming-birds ; the trumpeter,

scarlet flamingo, &c. Freshwater turtles are numerous; and the cayman or alligator (fig. 143) abounds in the streams. The iguana inhabits the sand-banks of the Esequibo; and in this region we meet with the gigantic Surinam toad (fig. 147). Many of the rivers and streams abound with the gymnotus, or electric eel (fig. 156); and also with a great variety of freshwater fish, among which is the beautiful crimson pirarucu, or *sudis gigas*, which is sometimes found fifteen feet in length.

The vast lowland, or basin of the Marañon, or Amazonas, forms one immense and magnificent plain, sloping gradually and almost insensibly downwards, from the base of the Andes to the shores of the Atlantic, traversed by the mighty River Marañon, or Amazonas,* and its numerous tributaries. The districts at the head of this basin contain valleys of singular beauty and fertility; but the remainder of this lowland is occupied by immense and impenetrable forests, thickly interlaced with gigantic creepers, and extending almost uninterruptedly for at least 2000 miles in a straight line. In the less elevated parts of this plain, the trees attain the grandest and most noble dimensions; but as the basin gradually rises above the sea level, the trees as gradually diminish in size, until they become dwarfish and stunted in growth, and at last finally disappear; the extent of the mighty forest being in fact limited by the zone of elevation above the sea level, at which the various plants which are natives of this lowland will ripen their fruit. Although by far the greater portion of this basin is occupied by these vast forests, "where the axe has never been heard," some tracts occur near the base of the Brazilian Mountains, which are nearly destitute of trees, and which in other respects resemble the llanos before described. These tracts are locally termed *sertam*, an abbreviation of "desertam."

The mountains of Brazil are of considerable extent, but not of great elevation, their average height not exceeding 2000 or 3000 feet, though some peaks nearly reach the altitude of 6000 feet. These mountains consist of several parallel ridges, generally running in a direction from north to south; but

* This river is called the Marañon in the early part of its course, and Amazonas after it enters Brazil.

various collateral branches diverge to the eastward, forming the vast headland of South America, which extends from the northern part of the province of Pernambuco to Santa Catherina. The scenery on this coast is generally beautiful, the shore in most parts rising immediately into

Half-circling hills, whose everlasting woods
Sweep with their verdant skirts the shadowy floods.

In the rear of these richly-fertile eminences rise the mountains, assuming the most romantic and picturesque forms.

The districts which contain the rich deposits of gold and diamonds, for which Brazil is celebrated, are situated to the south of the principal range. Topazes of great beauty, and considerable size, are also met with, and the chryso-beryl, the green tourmaline, or Brazilian emerald, as well as beautiful amethysts, are of frequent occurrence. Iron and copper are said to abound in the interior.

To the south and west of this mountainous territory, extends the third vast lowland of South America, which may be considered as including the immense plains of La Plata, and also Eastern Patagonia. The plains, or rather the one vast plain of La Plata, presents, perhaps, the most extensive and unvaried level surface on the globe, being bounded on the west by the eastern slopes of the Andes, which in some parts rise with such abruptness, that the traveller is able to descry the base as well as the pinnacles of this mighty range; whilst the forest-clothed pampas are seen reaching to their very foot, and stretching interminably towards Brazil. In other parts, however, these pampas are covered with blown sand, without any rock, water, or trace of vegetation, the sand being formed into waving hillocks, resembling in shape the inner edge of a scythe; similar, it will be remembered, to those before described as occurring in the southern districts of Arabia. In other parts, these pampas are covered with crops of long grass, extending for miles without being varied by a single weed: in others, again, they are occupied by immense beds of thistles, having, however, a rich under-bed of clover,—the latter being indigenous to this region, whilst the thistles are natives of Southern Europe, or Northern Africa, which have spread over these plains. A vast portion of the interior of this region is

unknown to Europeans; many large districts, with whose names we are hardly acquainted, but which abound in nature's gifts, being situated in the mountainous country formed by the eastern declivities of the Andes. The scenery in those parts which have been visited, is described as particularly beautiful; the towering, snow-covered summits of the more distant Andes, their sharp peaks of various forms, heights, and sizes, forming the back-ground; the inferior mountains, green to their very summits, their upper portions being covered with forests of walnut, oak, red-cedar, and lime-trees, and their skirts clothed with thick forests of the various species of trees peculiar to hot climates. Numberless streams also dash down the sides of these mountains, whilst occasional openings of vast quebradas, or ravines, impart an air of magnificence and grandeur, by the alternation of gigantic masses of light and shade. These districts abound in the richest mineral treasures; coal is also met with, and inexhaustible deposits of salt. Among the trees more peculiar to this region, is the *mistol*, which is a large branching tree, the fruit of which, described as resembling a Kentish cherry, forms a considerable article of food with the natives.

A rich tract of country extends between the rivers Parana and Uruguay; and in this district grows the famous Paraguay tea-tree (fig. 126), which is a species of *ilex*, the leaves of which are said to form a fair substitute for the Chinese tea-plant. Between Buenos Ayres and Cape Corrientes, the country is also rich and varied, diversified by hills, and well supplied with water. Beyond this, however, the surface becomes flat and less fertile; and as we approach the Rio Negro, the country appears remarkably destitute of both animal and vegetable productions, and scarcely any other plants are met with on the banks of that river, except a fringe of low willows.

To the south of the Rio Negro, extends the territory of Patagonia: the general character of this country appearing to be that of a succession of desolate steppes, or level plains, of various elevations. Sea-worn pebbles cover the greater portion of these plains, which are destitute of trees; thorns and prickles, a few withered shrubs, and a yellow kind of herbage, constituting the sole vegetation, excepting near the River

Santa Cruz, which, however, is not much more prolific in animal and vegetable productions than the Rio Negro, scarcely a bird or any other animal appearing to enliven the scene; though the guanoco, a species of llama, and the rhea, or American ostrich, are here occasionally met with. Towards the base of the Andes, the country improves in character, and the vegetation becomes more varied; and in this part, apple-trees are mentioned as being remarkably abundant.

The animal and vegetable productions of Brazil contrast strongly with those of the desolate Patagonia; indeed, Brazil may be regarded as the region of flowers, birds, and insects, nature, in this territory, being displayed in her gayest and most brilliant colours, as well as most varied and attractive forms. The never-ceasing power of vegetation causes the trees to shoot up to a majestic height, presenting, at the same time, an almost endless diversity of stem, leaves, and blossoms. Here we find the luxuriant *lecythis zapucao* (fig. 18,) with its large pendent fruit, called the *sapucaya-nut*, in form resembling an urn or a vase, and containing numerous seeds of the size of almonds, which are said when fresh to be scarcely less agreeable in flavour; the *bombax*, or silk cotton tree (fig. 34), the citron, or lime (fig. 45), the *Siphonia elastica*, or caoutchouc tree (fig. 50), the purple-flowered *caesalpinia* (fig. 68), producing the Brazil-wood of commerce; the feathered jacaranda (fig. 74), with its gold-coloured flowers, which yields the well-known timber called rose-wood; the trumpet-tree; the shining-leaved *Sapindus saponaria*, or soap-tree, the nuts of which are frequently strung for rosaries, and which are commonly known as "soap-beads;" a name they have acquired from the occurrence of a glutinous pulp, between these seeds and the outer rind, which is used by the Indians as a substitute for soap.* In this region we also meet with the *Bertholletia excelsa*, crowned with its valuable nuts, called Brazil nuts; with groves of orange, myrtle, coronilla, &c.; with the banana, or plantain (fig. 167); besides various species of palm (figs. 173, 181, 182, 186), and the arboresecent fern.

* These nuts, or seeds, are said to be so poisonous, that caution is required in handling them.

The mandioc, or cassava root (fig. 49), from which tapioca is obtained, the *Convolvulus batatas*, or sweet potato (fig. 128), the pine-apple (fig. 170), also flourish in this region, with a vast abundance of climbing and parasitical plants, among which are the gigantic bejuco, and the superb flowers of the orchideæ, the air-plants, bromeliæ, tillandsiæ, and a multiplicity of curiously-formed ferns. The swampy districts near the sea-coast, like those of other tropical lands, are covered with forests of mangroves; and in the rivers of La Plata, reeds grow to an enormous size.

Among the animal productions of Brazil, we are struck with the number and variety of the monkey tribe; no less than sixty-five species being described as natives of these forests, all differing from any in the Old World. The bats also are extremely numerous; and among these, some feed solely on fruits, but others, the true vampires, suck the blood of animals, and even of man. The ferocious quadrupeds are mostly of small size, and not very abundant in species. The largest of this tribe are the puma, or cougar (fig. 12), sometimes, as before-mentioned, erroneously called the American lion; and the jaguar (fig. 14), also erroneously called the American panther. Besides these, we meet with the ocelot, and several elegantly-marked tiger cats. The *coati-mondi* (fig. 33), is also an inhabitant of this region; where we likewise meet with a species of opossum; with the Brazilian porcupine (fig. 55*), which differs greatly from the common porcupine, and is furnished with a prehensile tail; the Patagonian cavy (fig. 56), capybara (fig. 57), sloth, or ai (fig. 58), armadillo (fig. 59), *chlamyphorus* (fig. 60), ant-eater (fig. 61), tapir (fig. 71), peccari, or bush-hog, &c. The llama has already been mentioned, and small deer are also said to occur in some parts.

The Brazilian woods are crowded with feathered inhabitants;

And through the forest's deepening glooms,
Birds of illuminated plumes,
Come forth like stars on summer night.

Among these are innumerable parrots and parroquets; the splendid mackaw (fig. 121), which frequents the palm, whose

stone-like fruit it cracks with great facility; the toucan (fig. 122), the trogons, the hang-nest oriole, the manakin, araponga, familiarly called the blacksmith, or the bell-bird, from the loud note which it utters, resembling the stroke of a hammer on the anvil, or that of the clapper of a bell; various chatterers, woodpeckers, and creepers; innumerable humming-birds, whose brilliant hues vie with the richly-tinted flowers around which they hover, &c. In the neighbourhood of the rivers, we meet with the scarlet flamingo (fig. 131), the pelican (fig. 133), spoonbill, gigantic crane, &c., whilst the rapacious birds present us with the great destroying eagle, one of the most formidable of the feathered tribe; the king vulture, and various owls, among which are the supercilious, or horned owl, and a small species, not much larger than a sparrow.

Alligators (fig. 143) occur in great numbers in some of the rivers; and serpents also abound in some parts. Among the latter is the anaconda, of which there are three species, including the boa-constrictor (fig. 149). Frogs are innumerable in some localities, and their croaking is almost deafening. These animals, as well as toads, are of unusual size in South America: and a species of frog, seen by Mr. Swainson, is described by him as "certainly bigger than the head of an ordinary man."

The insects of Brazil are not less splendid than its birds; the butterflies and moths are of a size and brilliancy unrivalled by any in the whole world; and six or seven hundred species are known which are peculiar to this region. Many of the beetle tribe are remarkable for their grotesque appearance, and others no less so for the splendour of their colours. The diamond-beetle is well known; but this is said to be quite eclipsed in splendour by two others of the same genus, which inhabit the southern provinces. The great fire-fly is a denizen of these woods. Ants are very numerous and destructive to man; scorpions and centipedes occur, but not of large size. Spiders of enormous size inhabit this region; and Lieutenant Smyth observed in the lowland of the Marañon, a spider's web of gigantic dimensions, which measured fifty feet in length, and twenty-five in height. The threads were very strong. It, however, did not appear to be the work of an

individual spider, but to belong to a whole family, or republic of spiders, which must be singularly social in their habits to form such an establishment.

The New Shetland Isles, though separated from America, appear to form a continuation of the mountain system of that continent, their geological formation being generally precisely similar to that of Tierra del Fuego. They are mostly mountainous, and present an exceedingly dreary appearance, being in many parts covered with snow to the water's edge, and nearly destitute of vegetation. The New Orkneys, Enderby's Land, and Sandwich Land, all appear to present a similar forbidding aspect. Trinity, or Palmer's Land, and Graham's Land, are little known; the latter appears to be of considerable elevation, and is supposed to consist of continuous land. Biscoe's range, which is a group of islands lying to the west of Graham's Land, includes the beautiful and imposing Adelaide Island, which consists of an elevated snow-clad peak, shooting up into the clouds, and of a lower range of mountains, remarkable for having only a thin covering of snow on their summits, though towards their base, they are buried in a field of ice and snow of dazzling brightness. Near the water's edge, a ledge of rocks occurs, riven and splintered in every direction, as if by some violent convulsion.

Owing to the great degree of cold, which, as has been before observed, prevails in the higher latitudes of the southern hemisphere, these islands are almost destitute of organized productions. The New Shetland Isles are situated in a lower parallel than Drontheim, in Norway, which, it will be remembered, is the northern limit of the cultivation of wheat; but, so severe is the climate of these southern lands, that the only vegetation consists of some straggling grass, and a species of lichen. No living quadrupeds have been found; and a very small number of birds; the latter consisting chiefly of penguins (fig. 138), and various species of petrel.

CHAPTER XXI.

GENERAL FEATURES OF CENTRAL AMERICA.—MEXICO.—
TEXAS.—GUATEMALA.—WEST INDIAN ISLANDS.

There, groves that bloom in endless spring
Are rustling to the radiant wing
Of birds, in various plumage bright
As rainbow-hues, or dawning light.
And from the fruit-tree spreading tall
The richly-ripened clusters fall,
Oft as sea-breezes blow.—WILSON.

CENTRAL AMERICA, properly so called, consists of an extended strip of land, stretching from north-west to south-east, separating the waters of the Atlantic from those of the Pacific, and connecting the two vast peninsulas of North and South America. The natural limits of this territory are marked, on the one hand, by the narrowest part of the isthmus of Panama, and on the other, by the isthmus of Tehuantepec. As, however, the physical features of the extensive territory of Mexico agree in many particulars with those of this portion of the New World, that region may be advantageously considered in the same division; in which we shall also place the large and important assemblage of islands, included under the general name of the West Indies.

The grand central mountain range, which in North America bears the name of the Rocky Mountains, and in South America, that of the Andes, may be traced through the whole of Mexico and Central America, but does not, in any part of these regions, attain the lofty elevation to which it rises in those vast and extensive mountain systems. In Mexico, the central line is continued in an elevated plateau, which constitutes the highest portion of the ridge, being on an average about seven thousand feet above the level of the sea, and extending from one extremity of Mexico to the other. This plateau is traversed, nearly at right angles, by a chain of

active volcanos, some of which are of great elevation, and which extend from east to west.

Mexico is rich in mineral deposits; iron, copper, lead, and mercury occur in some parts; and gold is also met with; but the most celebrated deposits are the silver mines, which are about three thousand in number. The mean annual produce of the latter mines is estimated at 1,500,000 lbs.; a quantity considered equal to two-thirds of the silver annually obtained from the earth over the whole surface of the globe.

Mexico, owing to its geographical position, and also to the peculiar configuration of its surface, presents some remarkable features in its natural productions. The most elevated part of its high table land is absolutely devoid of vegetation. This is not, however, attributable to its altitude, and consequent low temperature; its elevation not being sufficient to produce this effect in the parallel in which it is situated; but is apparently caused by its want of moisture, which in great measure arises from the porous nature of the rocks. The surface is also covered with a saline efflorescence, which increases its unfitness for vegetation. As soon, however, as any slopes occur, a more humid climate prevails, and these districts are adorned with vegetation of extreme variety and beauty. The central portion of the plateau is traversed by numerous valleys, the wide basins of which are usually not more than one thousand feet above the level of the sea. In the more elevated parts of these valleys, the steep declivities are occupied by forests of pine, oak, and beech, whilst the basins are adorned with the graceful foliage of the palm, and other tropical plants. And thus, the traveller, passing down one of these magnificent ravines, finds himself almost suddenly transported from the midst of the productions of temperate climes, to those of the torrid zone.

Among the vegetable productions of Mexico we meet with many North American species; but its flora has, on the whole, a greater similarity to that of South America. Thus, in the valleys, we meet with the caoutchouc tree, the cow-tree, the banana, vanilla, agave, or American aloe (fig. 168), &c. The most characteristic feature, however, of the Mexican flora, is the vast abundance of plants of the cactus kind, the latter

succulent plants being adapted to flourish in the more arid districts. From the agave, or American aloe, called also the



The Agave, as prepared for producing Pulque.

maguery, the natives prepare a fermented liquor, called *pulque*. The plant, though growing on the most arid spots, where scarcely any soil covers the rocks, is remarkable for the enormous supply of sap it yields, of which the pulque is made. This sap, or "honey," as it is termed, is obtained by cutting out the central or flowering shoot, at the same time leaving the outside leaves to form a cup. Into this receptacle, the abundant sap designed to nourish the flower rises in great quantities, and, being set to ferment, it forms the pulque. The paper on which the ancient Mexicans painted their hieroglyphics was made from the leaves of the agave. Many of the half-hardy plants which adorn our gardens, are natives of the temperate regions of Mexico; and among these the dahlia holds a conspicuous place. Barley and rye succeed on the higher land; and the wheat of Mexico is considered to excel that of all other countries, whilst maize arrives at the greatest perfection in the valleys. The banana, however, forms a very principal article of food, and the mandioc, or cassava-root, is much cultivated.

The assemblage of animals usually met with in different regions, forms a very striking feature in the zoology of Mexico. "Here may be seen," says Dr. Richardson, "wolves of northern aspect, dwelling in the vicinity of monkeys; humming-birds returning periodically from the borders of the frozen zone, with the northern buntings and soft-feathered titmice, to nestle with parrots and couroucuis; our common European whistling duck, shoveller, and teal, swimming in lakes, which swarm with sirens, and wherein the northern phalaropes seek their food, in company with Brazilian parras and boat-bills: associations which occur in no other region of the earth." But although the central situation of Mexico, and the configuration of its surface, cause its fauna to display some unusual features, it is not exempt from the universal laws regulating the distribution of animals, and is capable of division into three zones or regions—the cold, the temperate and the hot. In the elevated *cold* region, the fauna assumes a northern character. The fields abound with hares, the woods with squirrels; there also we find some of the weasel tribe, and a wolf resembling the Canadian species. The Virginian horned owl, the common barn owl, and other rapacious birds occur; whilst snow-buntings, finches, &c., occupy the woods, and several of the northern ducks cover the extensive alpine lakes. In the *temperate* region, deer, opossums, and some species of squirrels, abound; and among the birds, are thrushes, hedgecreepers, and warblers. The *hot* and low maritime tract, and the interior valleys, nourish numerous South American species, such as howling monkeys, armadillos, ant-eaters, coatis (fig. 33), peccaris (fig. 73), jaguars, and ocelots (fig. 15), besides macaws, parrots, tanagers, and various other birds commonly met with in the Brazilian region. Sixty-eight species of land birds have, however, been described as peculiar to Mexico. The insects are little known, though one species, the cochineal, must not be passed unnoticed. This insect is met with, or has been introduced into other parts of the world; but it is only in Mexico that it has been cultivated with complete success for the beautiful dye it affords. It is not improbable that the difference may be owing to the food of the insect, which, in Mexico, consists of a species of cactus (fig. 23), called the

nopal tree. At one period, above 2,000,000 lbs. of those little insects were annually exported from Mexico.

Texas, the estimated extent of which is nearly four times that of France, does not appear to contain any lofty mountain ranges, though these are, nevertheless, of sufficient elevation to give rise to several important rivers. The coast is very flat, consisting chiefly of prairies, covered with abundance of very fine grass, in some parts extending inland for 150 miles, and by no means adapted for the abode of Europeans. The interior is occupied by rich woodlands, in which the evergreen oak and the magnolia constitute the predominant trees; the underwood in some parts consisting of various species of cactus, including the opuntia, or prickly pear, the fruit of which has more than once afforded food for many days to armies traversing these regions. The more elevated districts contain much good grazing land, and the prevailing trees in these parts are the cedar and the cypress. The woods are described as being "alive with deer and antelopes and various kinds of birds," including the wild turkey; "no want of rattlesnakes and centipedes; and occasionally a puma and a jaguar are met with." Bears and buffaloes occur in some of the upper grazing lands, whilst vast herds of mustangs, or wild horses, roam over the prairies near the coast.

Central America Proper comprises the territory of Guatemala. The grand range of mountains, which we have observed forming the high table-land of Mexico, extends into this country, in which, however, it becomes twice depressed. It retains its elevation in the north-western part of Central America, and first loses its great altitude near Nicaragua, though it again rears itself in the province of Veragua, where it is crowned by a very fine plain or table-land. In the eastern part of this province, however, the range becomes broken into detached mountains of considerable height, and of the most abrupt and rugged form. Beyond these appear innumerable conical hills, not exceeding three hundred or four hundred feet in height, surrounded by plains and savannahs; at length these hills disappear, and for a few miles the country becomes uninterruptedly low and flat. Ere long, however,

the conical hills reappear, and gradually thickening, at length unite, and form a small mountain range of some elevation, which extends from Porto-Bello (or Puerto Belo), to the bay of Mandingo, where a second depression occurs. The land from this point continues comparatively flat through the provinces of Darien and Choco, in which part the only indication of the ridge consists in the water-shed; the rivers on one side flowing into the Atlantic, and, on the other, into the Pacific. The narrowest portion of the isthmus is near the city of Panama, where it does not exceed thirty miles in width. The mountains in this part are not more than one thousand or eleven hundred feet above the sea; but are more elevated near Porto Bello, where they are mostly covered with thick and almost impenetrable forests. The base of the range, on either side, is skirted by low plains of alluvial formation, presenting generally flat and swampy districts, uncongenial to European constitutions, and swarming with musquitoes, but producing the most luxuriant tropical vegetation. Nineteen active volcanoes occur in this region, which is also subject to violent earthquakes.

In a country with a climate so unhealthy, and subject to such fearful visitations, we might almost expect that man would scarcely be induced to fix his abode; but its natural productions are so rich and varied, and the climate, in the more elevated districts, so totally differs from that of the low plains, being peculiarly delightful and salubrious, that its attractions are very considerable; and it appears more than probable that it will, ere long, become the highway of nations, preparations being in active progress for the formation of a railroad across the Isthmus of Panama, commencing at Navy Bay in the Gulf of Mexico, which is described as a fine land-locked harbour, though the entrance is narrow between two bold bluffs; and having its western terminus near the small island of Tobago in the Pacific Ocean, which is said to possess good anchorage-ground, and which is not only covered with luxuriant vegetation to the height of 1000 feet, but contains an unfailing spring of good water. Central America abounds in metallic deposits; gold and silver have been found in all the mountains that have been examined; and Costa Ricca (the

Rich Coast) has acquired its name from the gold and silver mines situated in that district. Zinc, nickel, antimony, copper, iron, and lead, are also met with.

The vegetable productions of Central America bear a general resemblance to those of Mexico; and vegetation varies in its cold, temperate, and hot regions. In the higher parts all the cerealia flourish, and nearly all the fruits and vegetables of Europe; whilst the productions of the flat country, besides many very valuable plants peculiar to its own soil, include most of those occurring in the West Indies, such as the mahogany (fig. 42), logwood (fig. 69), chocolate tree, various palms, &c. Among those peculiar to this region, is a species of chesnut, the fruit of which contains a large supply of oil, of



Chocolate Tree.—*Theobroma Cacao*

which candles are made, said to resemble wax, and to burn with a remarkably clear and steady light. The hand-plant is a native of this region, where it forms vast forests. Wheat, rice, sugar, cocoa, indigo, cotton, &c., are cultivated here; the latter, known in the European markets as "green-seeded," being much esteemed for the fineness of its texture. The zoology of Central America is little known, but we may mention the guana, or iguana (fig. 145), as an inhabitant of the warm districts.

The large and fine group, or rather groups of islands, included under the name of the West Indies, are distinguished for their rich products. These islands are generally of mountainous character; each island usually consisting either of a single mountain, the slopes of which, with the plains at its base, constitute the island; or of a more continuous range, presenting similar general features.

The greater number of these islands appear to be of volcanic origin; though the minute coral polypus, the *Madrepora muricata* (fig. 177), has also contributed largely to their formation; and coralline rock is not unfrequently found alternating with layers of volcanic matter, and, in some instances, forming the uppermost stratum of an island. These remarkable, and in the economy of nature, important animals, are adapted to dwell only at a certain and restricted depth under water, and cannot exist above its surface; it might, therefore, at first sight, strike us as very extraordinary, and almost unaccountable, that elevated land, apparently of recent origin, should be composed of this substance. But, when we take into consideration the vast convulsions to which this region is subject (a point to which we shall presently direct our attention), and the elevation and subsidence of land frequently caused by such commotions, we shall not hesitate to agree with Mr. Darwin, that successive subsidences of the land may have rendered the summits, whilst still under water, suitable localities for the coral polypi, and that thus these vast accumulations have been formed: and finally, a whole island, or group of islands, may have been subsequently upheaved, and raised to the present position above the level of the sea.

The large island of Cuba contains deposits of native gold,

of silver and copper. In the same island a remarkable deposit of bituminous coal has recently been discovered, which, instead of occurring in beds or strata, is described as occupying a *vein*, presenting the appearance of having been filled from below. This coal is said to be wholly unaccompanied by traces of vegetable matter, and to burn with much flame and smoke. The vein commences, or *crops out*, immediately under the thin alluvial soil, and occurs in the igneous rock called serpentine, but is bordered by soft clay. As far as this singular deposit has been traced, it follows an irregular, but nearly perpendicular direction: it has been explored to the depth of thirty feet or more, and increases in thickness in the lower portion. This substance is wholly unaccompanied by beds of shale, and lies in parallel horizontal layers, having a conchoidal fracture. A similar formation has been found in another part of Cuba, about eighteen miles distant from Havaña.



30 Feet.

Section of a Vein of Bituminous Coal in the Island of Cuba.

Petroleum also occurs in great abundance in the same vicinity, rising in the form of springs from the serpentine rock. Asphaltum is met with in considerable quantities on the shores of the Bay of Havaña, and is employed, like tar, for pitching vessels. It is a curious fact, that Havaña was originally called *Carine* by the discoverers and early occupiers, because they there *careened* their ships, and pitched them with the natural tar they found on the shores of this beautiful bay.

The asphaltum or pitch lake of Trinidad has long been celebrated. It is about three miles in circumference, and situated in a clayey soil, appearing to be supplied by bitumen springs. In the hot season, this lake is in a state approaching to fluidity; but in the rainy, or cool season, it is sufficiently solid to bear any weight.

Situated as these islands are, within the tropics, and possessing the advantages of an insular and moist climate, their vegetation is of the most beautiful and splendid description. Here the various palm-trees—the cocoa-nut palm, date palm, and cabbage palm—rise majestically, accompanied by the fern-tree, the pandanus, or screw-pine, the avocado pear, the *Myrtus pimenta* (fig. 15), which produces the allspice, or pimento of commerce; the banana, mango, calabash (fig. 134), teak, mahogany, and the papaw tree, the milky juice of whose fruit possesses the remarkable property of making tender any meat steeped in water impregnated with it; nay, the very vapour of the tree serves the same purpose; and it is said to be customary in Barbadoes to suspend the meat and fowls on its branches to prepare them for the table. Innumerable cacti and euphorbiæ are also met with, as well as fantastically-shaped orchidaceæ. Climbing plants are also in great profusion, ascending to the tops of the loftiest trees, and hanging in wild profusion from their branches. Among these may be mentioned the passion flower, of which there are four species, all of great beauty, and producing the fruit called in the West Indies the grenadilla. The pine-apple is a native of these islands; and also the mammee, which is considered one of the best West Indian fruits; it is described as being in appearance not unlike a russet-apple, but with pulp

resembling a fine apricot, and with a delicious flavour. In this region also grows the maranta (fig. 166), from which arrow-root is obtained; whilst the spice plants, ginger (fig. 164), and other productions of distant intertropical regions, have been introduced into these islands, where they thrive luxuriantly. In these islands we find also the deadly manchineel (fig. 54), under whose poisonous influence not even a blade of grass will grow.

The native animals of the West Indies are little known; but among the most remarkable of those with which we are acquainted, are the agouti (considered as the representative of the hare), the common iguana, and the iguana lizard. The green turtle (so called from the colour of its fat, and held in high estimation by epicures) is a native of these shores.

The birds bear much resemblance to those of the neighbouring mainland; and of all the islands, Trinidad appears the most prolific in the feathered tribes. The humming-bird; the "fairy king of flowers," in that island presents some of its splendid varieties; among which are the ruby-topaz, the ruff-necked, and the emerald-crested. Pelicans, great white herons, and flamingoes frequent the salt marshes.

It is a general remark, that in islands, the species of insects are less numerous than on continents; nor do the West Indies present any of particular interest. Many of our readers may be familiar with the little round substances, having the appearance of grains, or seeds of gold, which are frequently sent over in boxes of small shells. These little gilded grains have been discovered to be the chrysalis case of an insect, which dwells among and preys upon the ants. On close examination, a small hole will be perceived, through which the insect has effected its escape.

CHAPTER XXII.

VOLCANIC REGION OF AMERICA.

The dread volcano ministers to good ;
 Its smothered flames might undermine a world.—YOUNG.

THE volcanic region of the Andes exhibits the phenomena of earthquakes and volcanos on the most appalling and magnificent scale. From the island of Chiloe (situated to the south of Chili), to the north of Mexico, a vast area extends, in some parts of which earthquakes and volcanic eruptions occur uninterruptedly. Nor, in fact, do these limits appear to form the actual termination of this volcanic region, for, though perhaps not equal in energy, traces of these commotions may be observed extending both further northward and southward ; and it is not impossible that future investigations may disclose, that the volcanic band stretches with greater or less force along the whole continent—

From the Antarctic, from the Land of Fire,
 To where Alaska's wintry wilds retire,

That it does extend to the "Land of Fire," or Tierra del Fuego, is, perhaps, not merely conjectural ; the appearance of vivid flashes of fire, observed by Captain Basil Hall, off that island, seeming clearly to indicate the existence of an active volcano, at no great distance from the Beagle Channel. And, that volcanic action extends almost to the Antarctic itself, is also evident, from the volcanic nature of Deception Island, one of the New South Shetland group, and from the indications of subterranean heat observable in that island.

We have already seen that these islands, from their general geological formation, appear to form a continuation of Tierra del Fuego, and that they are mostly covered with snow to the water's edge. In this respect, however, the volcanic island of Deception differs from the others, being in great measure

denuded of its snowy mantle, a circumstance apparently attributable to the warmth of its soil, which is black, and composed of cinders. The shape of this island is one of common occurrence in volcanic formations, that of a nearly circular shell, inclosing a bay or inland sea. The principal part of the island is formed of alternate layers of ice and volcanic ashes, thus conveying the impression, that the snow of each winter had, during a series of years, been preserved between layers of cinders. That volcanic action is still in force, at least internally, in this island, appears from the circumstance, that not less than 150 chasms, or fissures, occur, from which steam issues with a loud hissing noise. The beach also abounds with hot springs; in some parts affording the extraordinary spectacle of water, at the temperature of 140° , issuing from beneath the snow-clad surface of the soil, and pouring into the sea, which, by this means, has its temperature raised above that of the surrounding waters.

Several active volcanos are said to exist in the Andes of Patagonia, but the most southerly of which any certain account has been given, is the flat-topped volcano of Yanteles, in front of the island of Chiloe.

The province of Chili contains at least nineteen well-known points of eruption, situated in a continuous line along the ridge of the Andes, many of these volcanic cones forming lofty summits. Among these we may mention, as the most remarkable, the elevated Villarica, which continues burning without intermission, the lofty Aconcagua, whose summit is almost always covered with snow, and the Petroleum volcano, from whence a stream of mineral pitch continually flows. This territory also exhibits the energy of subterranean heat to a remarkable degree, in the phenomena of earthquakes, a year never passing without several shocks, whilst convulsions of the most tremendous description have from time to time occurred; in some instances, agitating the whole country from one extremity to the other, and permanently raising extensive tracts of land from one to twenty feet above their former level: but destroying the works of man, and not unfrequently involving him in their ruin. Nor are these awful convulsions confined

to Chili; they extend continuously in full energy along the whole line of the Andes, from the southern extremity of Chili to their northern termination. And so far from being of less frequent occurrence in the present day, these catastrophes have been repeated at shorter intervals since the commencement of the nineteenth century than at any former period on record. After the first discovery of those countries, an idea prevailed that these convulsions of the earth's crust occurred at intervals of a century; afterwards it was supposed, that about fifty years was the term which usually elapsed between violent earthquakes; but recent facts clearly prove that their occurrence is far more frequent, and at no fixed term. Thus, severe earthquakes have occurred at Caraccas, in the year 1812; at Copiapo, in 1818; at Santiago, in 1822; at Bogota, in 1827; at Lima, in 1828; at Santiago, in 1829; at Huasco, in 1832; at Concepcion, in 1835; and at Valdivia, in 1837. And the mighty effects produced by some of these tremendous convulsions lead to the conclusion, that "the same causes are still in operation, which, ages since, raised tertiary formations to their present lofty site in the great range of the Cordillera." It may not be without interest to the reader, to consider some particulars of the most remarkable of these tremendous agitations of the earth's surface; those of November, 1822, and of February, 1835.

The destructive earthquake which occurred in November, 1822, and which greatly injured Santiago, Valparaiso, and several other towns, was felt simultaneously throughout a space of 1200 miles from north to south; and in the neighbourhood of Valparaiso, the coast, for a length of 100 miles, was permanently raised from three to four feet above its former level.

The area over which this permanent alteration in level is conjectured to have extended, is 100,000 square miles; a space equal to half of France. The whole district, from the foot of the Andes to a considerable distance out at sea, is supposed to have been upheaved; the greatest rise being about two miles from the shore, where it appears to have been about five, six, or, in some places, seven feet. "If," observes Sir Charles

Lyell, "we suppose the elevation to have been only three feet on an average, it will be seen that the mass of rock added to the continent of America by the movement, or, in other words, the mass previously below the level of the sea, and after the shocks permanently raised above it, must have exceeded seventy-five cubic miles in bulk, which would be sufficient to form a conical mountain two miles high (or about as high as Etna), with a circumference at the base of nearly thirty-three miles." The tremendous, though almost inconceivable, force required to effect this mighty movement, may be more forcibly impressed on our minds if we follow Sir C. Lyell in his computation of the weight of rock which must have been raised. Taking the mean specific gravity or density of the rock at about two and a half that of water, so that a cubic yard would weigh about two tons, Sir C. Lyell computes that the rock added to the continent by this earthquake, must have more than equalled six hundred thousand million tons. "But," he continues, "it must be borne in mind, that the weight of rock, here alluded to, constituted but an insignificant part of the whole amount which the volcanic forces had to overcome. The whole thickness of the rock, between the surface of Chili and the subterranean forces of volcanic action, may be many miles or leagues deep." Assuming the thickness to be only two miles, Sir C. Lyell proceeds to compute the weight of the mass which must have been moved by this convulsion: but here, ordinary numbers altogether fail us, and we cannot but pause, filled with awe and admiration at the mighty energy of subterranean heat; or, more properly speaking, at the omnipotent and unseen Hand which directs its forces:

. Thee, O Father, this extent
Of matter, Thee, the sluggish earth, and track
Of seas, the heavens and heavenly splendours, feel,
Pervading, quickening, moving.*

The great earthquake of the 20th of February, 1835, was felt at all places between Copiapo and the island of Chiloe,

* The mode which Sir C. Lyell adopts of computing the weight of matter elevated by this earthquake, is by a comparison of the mass with that of the great pyramid of Egypt. Assuming the latter to weigh, if solid, six million tons, the rock raised would exceed in weight 363 million pyramids!

in a direction from north to south; and from Mendoza, on the eastern side of the Andes, to the island of Juan Fernandez, in a direction from east to west. But though the oscillations of the earth did not reach beyond these limits, the deep-seated subterranean volcanic agency appears to have extended much further; for the igneous vents of the whole range of the Andes are said to have been in remarkable activity, both preceding and at the moment of the convulsion. From the volcano of Yanteles, to that of Cosegüina, in Central America, violent eruptions appear to have occurred throughout the whole line. The tremendous eruption of Cosegüina (to which we shall again have occasion to refer) commenced on the 19th of January. On the 20th, the volcano of Osorno, north-east of Chiloe, burst forth with inconceivable fury. Aconcagua, Mayhu, Petoroa, and various others, were also in a state of great activity previous to the earthquake, whilst others burst forth shortly after its occurrence.

The earthquake commenced at half-past eleven in the morning, the atmosphere at the time being remarkably serene and beautiful. The inhabitants, however, were not wholly unprepared for the catastrophe; the flight of numerous flocks of sea-birds hurrying to the shore warned them of the approaching convulsion, and the greater number quitted their dwellings, and retired to a place of greater security. It is also said that the dogs all quitted the sea-port of Talcahuano. The lives of nearly all the inhabitants were thus spared; but, had it not been for these warnings, how dreadful would have been the catastrophe; for, in *six seconds*, the city of Concepcion, the sea-port of Talcahuano, and some other places, were totally laid in ruins. One only house is said to have remained standing at Talcahuano; but this, unlike the others, which were built on a sandy or alluvial formation, was founded on a rock. "The stunning noise of falling houses," says Captain Fitz-Roy, "the fearful cracking of the earth, which opened and shut rapidly in numerous places, the stifling heat, the blinding and smothering clouds of dust, the extreme horror and alarm, can neither be imagined nor fully described." About half an hour after this fearful vibration, the sea, in the bay of Concepcion, retired so much beyond its usual limits,

that all the rocks and shoals in the bay were visible, and some ships were left grounded, which had been previously lying in seven fathoms' water. Shortly afterwards, an enormous wave was seen slowly approaching the shore. It rolled majestically on for ten minutes, giving the inhabitants time to escape to the heights, when, breaking with tremendous force on the beach, it overflowed the whole of Talcahuano, carrying all before it, and rising to the height of twenty-eight feet above high-water mark : then, retreating with an appalling roar, it bore out to sea every moveable article that the earthquake had not destroyed. A second and a third wave, each more enormous than its predecessor, succeeded; after which, though earth and water trembled, no additional destructive convulsions took place. During the approach of these great waves, submarine eruptions were observed in the ocean, and similar phenomena occurred off the island of Juan Fernandez. Throughout the whole of the provinces of Canquenes and Concepcion, the entire crust of the earth was rent and shattered in every direction; circular pools, filled with salt water, were formed in some parts, and also extensive fissures. In other places, the ground swelled like a bubble, then, bursting, poured forth black sulphureous streams. An elevatory movement also took place; the little island of Santa Maria, in the bay of Concepcion, having been raised ten feet above its former level, at its northern extremity, nine feet in the centre of the island, and about eight feet at the southern cove.

The sensation occasioned by the undulatory movements is described by Mr. Caldclough as being "similar to that which would be produced by standing on a plank, the ends of which rose and fell two feet from the ground." At Concepcion, previous to the most severe shocks, a violent report was heard to the southward, as if proceeding from a volcano in that direction.

In the midst of this scene of destruction, some very remarkable and providential escapes occurred. A mother hastily retreating with her children, immediately after the great shock, saw one of them fall into a hole; a wall, close to her, was tottering, she however pushed a shutter over the hole into which the little child had fallen, and hastened onward with

her other children. The wall fell, and covered the hole with masses of brickwork, but on the next day the child was taken out unhurt. The fate of another child was very remarkable. A servant maid had taken refuge with a little boy in a small boat; the enormous wave, on its retreat from the shore, swept off this boat, and dashing it against an anchor which was lying on the beach, divided it into two parts, one of which held the servant, and the other the child. The poor woman was drowned, but the little boy, who was only four years old, was carried out into the bay; he, however, clung firmly to the fragment of the boat, and the little fellow was afterwards picked up, cold and wet, but quite uninjured.

Near the coast of this region of terrific earthquakes an^d volcanos, three volcanic islands were discovered on the 12th of February, 1839, situated between its shores and the basaltic island of Juan Fernandez. One of these islands, at the time of its discovery, appeared to be in the act of rising out of the sea.

The most northern of the Chilian volcanos is situated near Coquimbo, between which place and Atacama, though no igneous vent has been observed, the connexion is maintained by earthquakes, and a convulsion of some severity occurred on the 20th of November, 1849. Entering Bolivia, or Upper Peru, we find the Western Cordillera of the Andes presenting a series of active volcanos, the most remarkable of which is Gualatieri, 22,000 feet in height. Peru is subject to almost continual earthquakes, and scarcely a week passes without the occurrence of a shock. In 1746, the magnificent city of Lima was entirely laid in ruins by an earthquake; and at the same instant, the sea retired from the port of Callao, about six miles distant, and then, returning with terrific impetuosity, totally destroyed that harbour, and changed the form of the coast. Four volcanos burst forth in the neighbouring mountains; and such vast torrents of water swept down their sides, that the whole country was inundated.

Colombia contains a series of stupendous volcanos, including the lofty cones of Cayambe, Cotopaxi, Pichincha, Antisana, L'Altar, and Tunguragua.

Cotopaxi is remarkable for the beautiful regularity of its

form, which is that of a perfect cone, usually covered with an enormous coating of snow; though on some occasions this vast accumulation of ice and snow has been suddenly and completely melted during an eruption. Thus, in January, 1803, the snows on its summit were all dissolved in one night, giving rise to frightful inundations in the surrounding country. The eruptions of this volcano have been more frequent and more destructive than those of any other in the Andes.

A very tremendous eruption occurred in the volcano of Tunguragua, on the 4th of February, 1797, which was accompanied by a violent earthquake; when the whole country round the volcano, to the extent of 120 miles from north to south, and sixty miles from east to west, sustained an undulatory movement of extreme violence, which lasted four minutes. The effects were most fearful. In the districts near the mountain, every town was levelled with the ground, and the cities of Riobamba and Quero were buried under the ruins of the shattered mountains. The base of Tunguragua was riven asunder, and streams of mud and water poured forth from numerous apertures, filling the valleys to the depth of 600 feet. Fetid exhalations were emitted by the Lake Quilotoa, from whence flames also are related to have issued. The whole face of the country was changed, partly by the throwing down and levelling the more elevated portions, and partly by the layer of mud which covered everything, and blocked up the channels of the rivers. During this eruption, vast numbers of the curious species of fish, called the *Pimelodes cyclopum*, were found in the ejected water of the volcano. The phenomenon of the eruption of fishes is not, however, peculiar to this volcano, having occurred in Cotopaxi, and also in Imbaburu. These fish are considered by De Humboldt to be identical with some found in the rivulets at the base of the volcanos. On some occasions, millions have been seen descending from Cotopaxi, either from its summit, or from apertures in its sides, with great masses of fresh cold water, nor do they usually present the appearance of having been exposed to the action of great heat.

Continuing our northward route, and entering New Granada, we find three volcanos in the province of Pasto, and three in

that of Popayan. The connexion of the volcanos of Pasto with the district of Tunguragua, was strikingly displayed in 1797. A column of black smoke had continued for several months to issue from the Volcano de Pasto, but, to the surprise of the inhabitants of the neighbouring region, the smoke suddenly disappeared on the 4th of February. It was afterwards ascertained that this happened at the precise moment when, at the distance of 135 miles, the city of Riobamba was, as we have just seen, destroyed by a tremendous earthquake.

The great volcanic chain having hitherto pursued its course nearly due north and south, at this point takes a wider spread, extending over the whole of the Caribbean Sea, which is supposed to be one continuous district of volcanic action; numerous instances of subsidences and upheavings of land, and other consequences of earthquakes, as well as volcanic eruptions, being on record in the islands it contains. The line or band of volcanos may, however, be considered as being more especially continued in Central America, which is subject to the most fearful convulsions of the earth, and in which territory, nineteen active volcanos occur; the most elevated of these being the water volcano, 12,600 feet above the sea, which has never been known to emit fire from its crater; the eruptions having always consisted of torrents of water and stones.

Among the most severe earthquakes on record, are those which have at two different periods destroyed the city of Guatemala. The destruction of this place in the year 1773 was of singularly awful character. It was built close to a volcano; and during an eruption of the latter, an abyss opened, when the whole city and all its inhabitants were swallowed up, every vestige of its former existence being entirely obliterated.

A very remarkable eruption took place on the 19th of January, 1836, in the volcano of Coseguina, situated in the Bay of Fonseca (usually called the Coast of Conchagua). The eruption was preceded by a rumbling noise, accompanied by a column of smoke, which issued from the mountain, increasing until it assumed the form and appearance of a large and dense cloud, which, when viewed at the distance of

thirty miles, appeared like an immense plume of feathers; rising with considerable velocity, and expanding in every direction. Its colour was at first of the most dazzling whiteness; but it gradually became tinged with gray; then passed into yellow; and finally assumed a beautiful crimson hue. In the course of the two following days several shocks of earthquakes were felt, some of great severity. The morning of the 22nd rose fine and clear; but a dense cloud of a pyramidal form was observed in the direction of the volcano. This gradually ascended; and by eleven o'clock, A.M., it had spread over the whole firmament, entirely obscuring the light of day, the darkness equalling in intensity that of the most clouded night, so that the nearest objects could not be discerned. The cattle hurried back to their folds; and the fowls went to roost. This darkness continued, with little intermission, for three days, being interrupted only by a lurid light which occasionally gleamed, or by flashes of lightning, accompanied by tremendously loud thunder-claps, sometimes occurring in regular succession, like the discharge of large pieces of ordnance. During the whole of this fearful obscurity, a fine black powder continued to fall; and when light again dawned upon the terrified inhabitants of the neighbouring towns, an extraordinary spectacle presented itself; every tree, every house, every individual, was so covered with this black dust, that neither form nor feature could be recognised. It was also deposited on the ground in some parts to the depth of ten feet.

The darkness extended over half of Central America; and above 40,000 square miles are said to have been covered with fine dust, ashes, and lava. It also appears, that some effects of this tremendous eruption spread to the distance of a thousand miles in every direction round the mountain. The detonations which accompanied the eruptions were tremendously loud, also extending to a remarkable distance; and it is a singular fact, that wherever they were heard, the sounds were supposed to proceed from some cause in the immediate vicinity. Thus, at Kingston in Jamaica, 800 miles from Coseguina, these reports were mistaken for signals of distress from the British sloop Fly, then lying off that port; but the fall

of ashes subsequently led to the conclusion, that the reports proceeded from a volcano. Immense numbers of cattle perished on this occasion; but it does not appear that any human lives were lost. Nay, even good sprang from this seeming evil; for it is a remarkable fact, that the fine volcanic dust thus spread over the plains, so far from injuring vegetation, appeared to produce an entirely contrary effect, and to render the plains abundantly fertile.

By this convulsion, the outline of the coast was changed, the course of a river turned to an opposite direction, and two new islands were formed in the Bay of Fonseca, at a distance of about two miles from the volcano.

It is remarkable that phenomena precisely analogous to those exhibited on this occasion at Cosegüina, occurred in an eruption of the volcano of Iraru, or Cartago, which took place in 1728, and which is described as having been attended with violent earthquakes, and with *a dense black fog, which lasted for three days*. The volcano of Cartago was again in eruption on the 2nd of September, 1841, being accompanied by a terrific earthquake, which destroyed the city of the same name, burying in its ruins about forty or fifty of the inhabitants.

The great volcanic band next enters Mexico; here, however, taking a transverse direction, and crossing the elevated land, which forms the continuation of the Andes and Rocky Mountains. In this region, volcanic forces are exhibited in at least equal energy, and, indeed, the whole table-land is supposed to owe its present form to volcanic eruptions, as it appears originally to have consisted of a series of granite valleys, which have been filled to the depth of several thousand feet by various volcanic products.

The chain of active volcanos which crosses this table-land from east to west, commences on the coast of the Mexican Gulf, with the small, but energetic Tuxtla; next to Tuxtla, is the vast cone of Orizaba, 17,374 feet above the sea; and beyond this, the lofty Popocatepetl, 17,716 feet above the sea. These lie to the east of the city of Mexico; on its west are the cones of Jorullo and Colima. These volcanos are all active; and, at no distant period, the snow-clad summits of Iztactihuatl,

of Toluca, and of Tancitara, situated in the same line, were also burning. These three mountains, as well as Orizaba and Popocatepetl, rise far above the limit of perpetual congelation; and from the snowy peaks of the two latter, smoke continually issues.

The most remarkable volcano in this region, however, is that of Jorullo, or Xorullo, the formation of which is not of older date than the middle of the last century. The site of the present volcano is about 100 miles from the sea, and, previous to the year 1759, consisted of some remarkably fertile fields, covered with flourishing plantations of indigo and sugar-cane, watered by two small streams. In the month of June of that year, subterranean sounds of an alarming nature were heard, attended by earthquakes, which continued for two months, when a temporary cessation occurred: but, on the 28th of September, the sounds recommenced with increased violence, and, during that night, a surface of ground, from nine to twelve miles in extent, rose up like an enormous bladder, to the height of above 550 feet: flames issued from the ground, and fragments of rock were thrown to a great height, accompanied by eruptions of mud: whilst the softened earth was observed to heave like the billows of the sea. The two little rivers poured their waters into the chasm, disappearing below the eastern extremity of the plain, and re-appearing as hot-springs at its western limit. Six volcanic cones were formed, the smallest of which was 300 feet in height; and Jorullo, the central volcano, was elevated to the height of 1695 feet above the level of the surrounding plain.*

Thousands of small cones, or mounds, called by the natives *hornitos*, or little ovens, were formed on the surface of the agitated plain, each of which sent forth columns of sulphureous vapour: this they continued to emit for many years, but it appears that this action has now altogether ceased, and also that no eruption has occurred in Jorullo since 1803. Vegetation is even making great progress on the sides of this recent volcano, and the fertile plain is again covered with luxuriant crops of indigo and sugar-cane. De Humboldt has remarked,

* The elevation of the summit above the sea is 4267 feet.

that this is perhaps one of the most remarkable physical revolutions in the annals of our globe; and yet, striking as it is, it almost yields in sublimity to the mighty movement effected by the Chilian earthquake of November, 1822.



Jorullo.

To the north of Mexico, we meet with at least one active volcano, situated in north latitude 28° , in Lower California, which, as far as our present information extends, may be regarded as the termination northwards of the volcanic band in its full energy; though, as we shall presently find, some traces of volcanic activity extend further in that direction. Let us, however, now turn our attention to the volcanic area of the Caribbean Sea, and the adjacent shores.

The coast of Caraccas has, at various periods, suffered severely from earthquakes. Cumana was destroyed by an earthquake in 1796; and a similar catastrophe befel the city of Caraccas on the 26th of March, 1812, when that city, and seven other towns, were almost totally laid in ruins, and nearly twenty thousand persons perished. This terrible convulsion extended to a great distance, for, besides violently agitating the whole of the Caraccas, a severe earthquake visited the island of St. Vincent, and convulsed the valley of the Missis-

issippi for the length of three hundred miles. So violent was the agitation in the latter locality, that large lakes, twenty miles in diameter, were formed in the course of an hour, and others as rapidly drained; deep chasms yawned in the earth, and the ground on which the town of New Madrid is built, is said to have sunk eight feet below its former level.

The greater number of the West Indian Islands appear to be of volcanic origin, and there are active volcanos in St. Vincent's and Guadaloupe, as well as solfataras on some of the other islands. An eruption took place in the volcano of Morne Garou, in the island of St. Vincent, in April, 1812, at which time nearly all the plantations on the island were destroyed. Earthquakes of great violence are not unfrequent in these islands, particularly in a line extending from Jamaica to St. Domingo and Porto Rico. A severe earthquake occurred in St. Domingo in 1751, when the face of the island is described as having been quite altered: mountains appearing where there were valleys; valleys where there were mountains; lakes where there were villages; and a new course being given to several rivers. Another severe convulsion occurred in the same island in 1770; and one of equally terrific character took place on the 7th of May, 1842, when the town of Cape Haytien was totally destroyed, and a large number of its inhabitants perished.

The volcanic region which we have now traced from the south of Chili, or perhaps from the island of Deception, to California and New Madrid, appears in South America to be chiefly confined to the western regions, no indications of volcanic disturbances having been observed in Guiana, Brazil, or Buenos Ayres. The remarkable volcanic formation near the River Santa Cruz, in Patagonia, is probably referable to a more ancient geological era.* In the eastern districts of North America, earthquakes are by no means of rare occurrence. We have already mentioned, that the valley of the

* This formation consists of an immense stratum of lava, which forms a plain extending in every direction, and being about one thousand feet above the bed of the river; whilst, in some parts, black lava cliffs, and masses of basalt, rise like frowning castles. "Wonderful, indeed," says Captain Fitz-Roy, "must have been the immense volcanic action which spread liquid lava over such an immense tract of country."

Mississippi was convulsed at the period of the earthquake which destroyed Caraccas, in 1812: South Carolina, at the same time, was also much convulsed.

Springs of inflammable vapour have been discovered in several parts of North America. The village of Fredonia, in the state of New York, is lighted by a natural discharge of gas, which is collected by means of a pipe into a gasometer.

Earthquakes are very frequent on the shores of the St. Lawrence, often of sufficient violence to split walls and throw down chimneys. Such effects were experienced in December, 1791, at St. Paul's Bay, about fifty miles from Quebec.

These convulsions and indications of subterranean heat appear, however, insignificant, in comparison with the stupendous volcanic forces we have been considering; nor can we regard them as a distinctly-marked continuation of the vast volcanic band. Whether future researches may disclose its prolongation in the more western parts of North America, is still matter of uncertainty, but traces of more decided volcanic action have been observed in this portion of the continent. Thus, near the source of the Missouri, amid the snow-clad summits of the Rocky Mountains, two peaks are said to occur, which emit smoke in considerable volumes, apparently from volcanos in a state of eruption. Boiling springs are also met with in the same vicinity. Traces of volcanic action have likewise been noticed in the Spanish River Mountains, and other parts lying between the Rocky Mountains and the Pacific; in which locality we also meet with the elevated volcanic cones of Mount Fairweather, fourteen thousand feet in height, and Mount St. Elias, sixteen thousand feet above the level of the sea. The two last-mentioned volcanos appear to be connected with the volcanic region of the Aleutian Isles, which, it will be remembered, form the northern commencement of the Asiatic volcanic region, and which thus appear to form a link, connecting the Old and New World.

CHAPTER XXIII.

OCEANICA.—AUSTRALIA.—NEW ZEALAND.—POLYNESIA.
—POLYNESIAN VOLCANIC REGION.—CONCLUSION.

. Through hardy enterprise
Many great regions are discovered,
Which to late age were never mentioned.—SPENCER.

OCEANICA, under which appellation may be included Australia, New Zealand, and the Polynesian Archipelago, forms another grand division of the globe.

The vast island of Australia, or New Holland, is about 2400 miles in length, and its width varies from 1200 to 1400 miles. This extensive tract of land does not appear to be traversed in its interior by any elevated mountain system; but, on the contrary, its principal mountain ranges border upon its shores, apparently encircling it on every side, and giving it, in this respect, some resemblance to Arabia and Persia. Finding that this region is possessed of this one natural feature in common with those territories, we shall be desirous of ascertaining whether any other similarity occurs; and upon inquiry we shall learn, that Australia, like Arabia and Persia, is remarkable for its deficiency of water; apparently not possessing any important river, and being, in some parts, subject to great droughts. The most characteristic feature of this region, however, seems to be the extensive lowland, which is supposed to occupy a very large portion of the interior.

The extreme south-eastern angle of Australia appears to enjoy a more agreeable climate than any other part of this vast island. Its greater distance from the equator gives it the advantage of a cooler temperature; to which the snowy mountains, called the Warragong Mountains, or Australian Alps, which are situated in this district, also contribute. Being likewise surrounded on three sides by the sea, it

possesses an insular climate, and abundant supplies of rain; and may be considered as one great basin, watered by the River Darling, River Murray, and their tributaries. Extensive downs occur, covered with excellent pasture; and some districts of so "fascinating a character," that Sir Thomas Mitchell has bestowed on the country to the south of the River Murray the appellation of "Australia Felix." The hills are generally of a conical form, and the rocks of which they are composed consist almost wholly of lava; a circumstance to which the greater fertility of this region may perhaps in part be attributed. Mount Napier, situated between Portland Bay and the Grampian Mountains, contains a crater. This mountain is surrounded for several miles by a rock of volcanic formation, and two extinct craters, named Mount Gambier and Mount Schanck, occur in the neighbouring districts of South Australia.

The Grampian Mountains may be considered as the commencement of a mountain system, which, running nearly parallel with the eastern coast of Australia, extends to Cape York and Endeavour Bay. The highest summit in this range is Mount William, 4,500 feet above the sea. In the parallel of Sydney, the range bears the name of the Blue Mountains. The mountains in this part do not appear to exceed three thousand feet in height, but, owing to the precipitous character of their surface, their more elevated parts are very difficult of access. The Liverpool range, which branches off to the westward, is of totally different character, the summits of this range consisting of rounded hills, or flat plains, covered with grass. The Hardwick range takes a northerly direction, and some of the loftiest summits in Australia appear to be situated in this part.

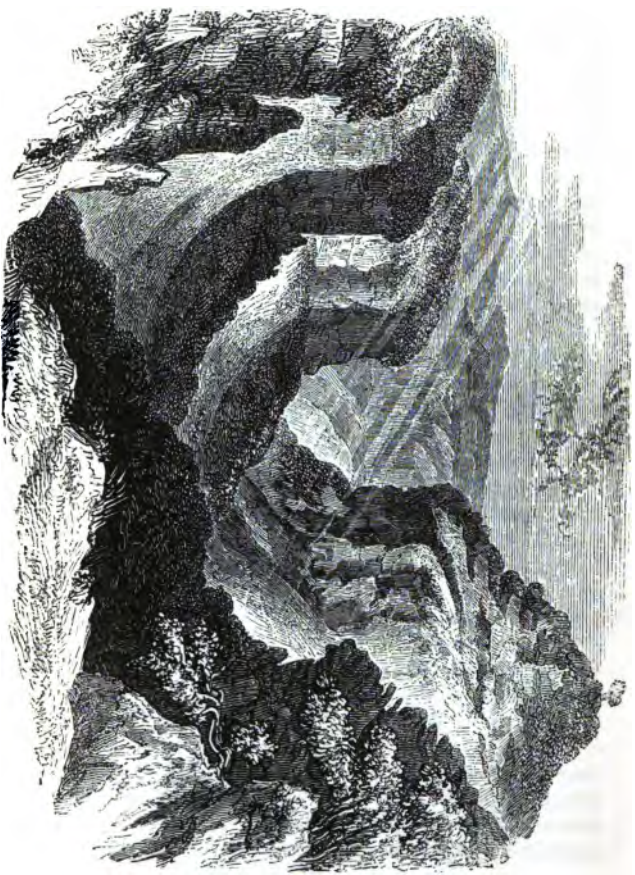
To the westward of this mountain system, a series of terraces occurs, which may be considered as the declivity of these mountains. These terraces consist of plains, of greater or less extent, separated from each other by low ridges; each ridge presenting a different geological formation. The terraces are destitute of timber trees, but are covered with luxuriant herbage, affording abundant food for cattle and sheep.

Beyond the terraces, the lowlands commence, the extent of which is yet unknown. These plains are in many parts extremely level, though in others they are slightly undulating; and they appear to have a general slope towards the south. In some districts they are wholly destitute of vegetation; whilst, in others, saline plants occur, without an intervening blade of grass. In Captain Sturt's harassing expedition into the interior, he passed over extensive plains spread out like a dark and gloomy ocean, the low ridges succeeding each other like waves of the sea, but covered with a wiry and matted grass; and in a distance of eighty miles, met with no other water than two putrid puddles. Some of these plains are covered with *polygonum*, a gloomy and leafless bramble; and in others, as far as the eye can reach, nothing is met with, except one kind of bush, forming a thick "scrub." The richest soils in this part scarcely produce anything better than a small number of stunted eucalyptus, or gum-trees, and cypresses; though a few highly-favoured spots are covered with good herbage, and trees of better growth.

The scenery in the Blue Mountains is of singular and striking character. These mountains consist principally of a succession of sharp ridges, intersected by remarkably abrupt and narrow ravines, or gullies, some of which are little less than 2000 feet in depth. Many of these ravines constitute the beds of rivers; and in some parts, numberless small cascades pour down the almost perpendicular sides. A chasm, or ravine, of this description, of great depth, but not more than 300 feet in width, forms the bed of the river Grose, a tributary of the Hawkesbury. Near one of the sources of that river occurs the cataract called Govatt's Leap; which, although the body of the water is inconsiderable, is remarkable for its great depth, and also for the character of the surrounding scenery. This cataract consists of a succession of cascades, the first of which is precipitated over a perpendicular rock, about 200 feet in height; and the entire fall to the bed of the river is estimated at full 1200 feet.

A remarkable burning mountain, called Mount Wingen, is situated on the eastern declivity of the Liverpool range. It was discovered to be in a state of incandescence in 1818, and

Govatt's Leap, Blue Mountains.



the process appears to be still (or was until very lately) maintained in full force. The mountain is composed of a solid mass of sandstone, and the fire extends over an area of about an acre and a half. Throughout this space, several chasms, or fissures, occur, from which volumes of smoke, accompanied by brilliant flames, are perpetually issuing. The principal of these fissures was, in the year 1831, about two feet in width, and on looking down this chasm, the sides of the rock are described as having been "of a white heat, like that of a lime kiln; whilst sulphureous and steaming vapours arose from the aperture, amidst sounds which issued from below, like blasts from the forge of Vulcan." The sides of the chasms were adorned with efflorescent crystals of sulphur, varying in tint from the deepest orange to a pale straw colour. No lava, or any other volcanic products, were observed in the vicinity of this mountain.

A range of mountains, more or less continuous, extends along the north-eastern coast, among which the most conspicuous is Mount Dryander, 4566 feet in height. The interior of this region is of diversified character. A group of mountains, situated about the 25th parallel of latitude, appears to form the water-shed in this portion of Australia, the River Murray and its tributaries flowing, as we have seen, to the southward, and another river, to which Sir Thomas Mitchell has given the name of Victoria, taking a northward course, and probably disemboguing itself in the Gulf of Carpentaria. This is supposed to be the best watered portion of Australia, yet, like most other parts of this vast island, the want of fresh water is a great drawback to its occupation, and even to the passing traveller. Some volcanic mountains, as also basaltic plains and streams of lava, were observed by Sir Thomas Mitchell in these districts.

Southern Australia appears, like Eastern Australia, to possess one of the characteristic features of the whole region, that of a ridge of mountains bordering on its shores, with a belt of country, of greater or less extent, and varying in fertility, lying between their base and the ocean. The same remark applies to Western Australia, where we meet with a succession of mountain ranges, running nearly parallel with the coast,

and with each other. The Rugged Mountains, so named from the rugged aspect they present, take their rise near St. George's Bay. The granite range of the Darling Mountains commences at Cape Chatham; and the less elevated Roe's range at Cape Lewin, all more or less taking the line of the coast. At the northern extremity of the Darling Mountains, and about thirty miles to the eastward of that range, rises the Victoria range, between the base of which and the sea extends a large district of fertile country, to which the name of Victoria Province has been given. Another range has also been observed, branching off in a westerly direction from the Darling Mountains, and forming the northern boundary of a well-watered district, immediately to the north of Perth. In some parts of Western Australia, however, the land is poor and sandy, though usually diversified with rich tracts near the principal streams; and in the latter districts, the fruits, both of warm and temperate zones, thrive luxuriantly. The interior of the country, as far as it is known, assumes generally a level character, and is covered with excellent pasture, and, in some parts, with forests, producing valuable timber.

The north-western angle of Australia, though its general aspect is rather uninviting, appears to contain some beautiful and fertile spots. On the coast, the prevailing character is that of rocky sandstone hills, about 300 feet in height, covered with brushwood and wiry grass, but intersected by beautiful valleys, with a fertile soil, and abundant supplies of fresh water. Further in the interior, the country in this part is described as generally flat, but presenting several fertile tracts. In the extreme north, between the Bay of Carpentaria and Port Essington, the Wellington Hills skirt the shore, whilst in the interior, the large valley of the South Alligator River is surrounded by a table-land, having steep walls or escarpments, 3800 feet in height. In the dry season, these districts present a parched appearance, but after the rains the ground is covered with the most magnificent grass.

Van Diemen's Land, or Tasmania (so called from its discoverer, Tasman), is an island of generally mountainous aspect; the main chain traversing it from north-east to south-west, and in some parts attaining an altitude of about 5500 feet

above the level of the sea, and either forming continuous ranges, or rising in isolated peaks, intersected by the most fertile plains and valleys, which are watered by numerous streams and rivers, and richly clothed with luxuriant forests. Five or six lakes occupy the higher regions, at an elevation of from 3000 to 4000 feet. The south-eastern portion of the coast is intersected by lagoons, much resembling the voes of the Zetland Isles, and forming excellent harbours; the deeply-indented peninsula of Tasman, though of great extent, being connected with the mainland by a narrow isthmus only a few hundred feet in width. At the extreme point of this peninsula rises the remarkable basaltic formation of Cape Pillar. Van



Cape Pillar, Van Diemen's Land.

Diemen's Land, as we have already seen, enjoys a mild and equable climate; and it is remarkable, that though Table Mount, which nearly overhangs Hobart Town, and which is less than 4000 feet in height, is covered with snow two-thirds of the year, the arborescent ferns in some districts grow to the height of thirty feet, with fronds twelve feet in length. The most prevailing trees, are, however, the eucalyptus and acacias, which attain the most magnificent dimensions.

The mineral deposits of a considerable portion of Australia

are still unexplored, though it appears that Southern Australia is rich in metallic treasures, for lead-mines are worked, and a very valuable deposit of fine copper occurs in the ridge of the Blue Mountains, situated to the north of Adelaide; in the same district, gold has also been recently discovered in considerable quantities, in the detritus and quartz pebbles spread over a surface of more than 300 miles. Some beds of coal have been discovered near Newcastle, situated to the north of Sydney, where it is associated with the remains of fossilized trees, and with iron-stone nodules, containing impressions of leaves. Coal also occurs near the Arrowsmith River in Western Australia, as well as in other localities. Van Diemen's Land contains rich deposits of iron ore; and copper, lead, zinc, and manganese are likewise found. Coal is also met with in considerable abundance.

In no part of the known world do we meet with so peculiar and so remarkable a flora as in Australia. Some trees occur, having their leaves twisted out of what appears their natural position; others with leaf-stalks performing the office of leaves; others having fruit with the stone placed on the outside; plants belonging to parasitical orders, growing on the ground; whilst, from the very remarkable construction and appearance of a leguminous plant, (a species of *acacia*,) a Dutch botanist actually mistook it for a fern; indeed, so singular and peculiar is the aspect of many of the plants belonging to this region, that the eye of an experienced botanist is required to determine their true botanical character. In the eastern districts of Australia, however, the vegetation assimilates in some degree to that of South America; in the western districts, to that of Southern Africa; and in the northern districts, yet nearer to that of the islands of the Indian Archipelago, the prevailing trees in the latter district consisting chiefly of some species of palm, including the fan-leaved palm, and the seaforthia, or cabbage palm; the arborescent fern (fig. 213); the *cycas media*, the nuts of which form the principal food of the natives at one period of the year; and the mangrove, which fringes the swampy shores near Port Easington. Here we also meet with a species of mulberry, of fig, of orange and lemon tree, all these, however, producing

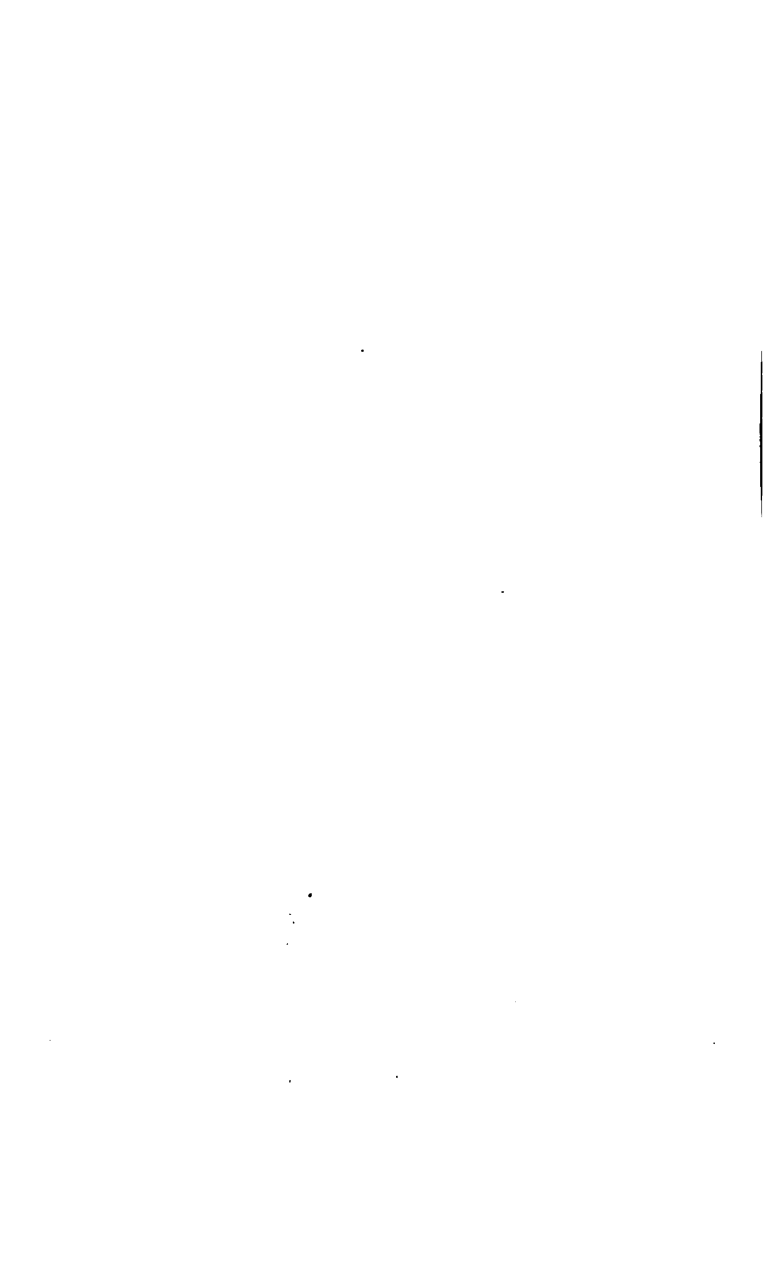
small fruit, whilst vines hang from tree to tree, and the lagoons are adorned by a splendid species of blue nelumbium, or covered with the pink blossoms of a *nymphaea lotus*, the seeds and rhizoma, or rootstock, of which, are eaten by the natives.

Among the plants more particularly characteristic of Australian scenery, are the eucalyptus (fig. 14), of which there are several species, commonly known under the general name of gum-trees, an appellation which has been bestowed on account of the gummy substance which exudes from the leaves and stems of these trees. The eucalyptus, in some parts, acquires splendid dimensions, and the "brown gum-tree" yields the timber called Australian mahogany. These trees, and the various species of acacia, or wattle trees (fig. 73), with their countless yellow-tufted flowers, constitute the prevailing trees in Australia. Some of the acacias present very extraordinary forms, being destitute of leaves, or having leaves of the most singular shape; and "the *Daviesias*," says Professor Lindley, "rival the acacia itself in the strangeness of their foliage; *daviesia quadrilatera* has leaves which look more like objects prepared to puzzle a geometrician, than like any already known in the vegetable kingdom." The *xanthorhea*, sometimes called the grass tree (fig. 193), of which there are at least fifteen species, is another characteristic tree of these regions; and produces a valuable aromatic gum, which is used as a cement, and forms an article of export to Great Britain. The *casuarina*, or swamp oak (fig. 106), which is remarkable for its long weeping thread-like branches appearing like the stem of an *equisetum*, forms the beef-wood of the colonists. In the south-western districts, plants of the order *proteaceæ* are very prevalent, presenting many genera and species of the most varied appearance, as well as surpassing beauty; among these, one species of *banksia* (fig. 116) is said to have a trunk fifty feet high, and more than two feet and a half in diameter. The *zamia* genus (fig. 139), which, like the preceding order, occurs in Southern Africa, also inhabits these western districts, to which, however, it is not confined: one arborescent species is described as attaining the height of thirty feet. The *araucaria excelsa*, or Norfolk Island pine (fig. 157), which grows

in the eastern districts of Australia, is one of the most lofty trees known to exist, and apparently only rivalled in height by the Californian pines. The pandanus, or screw-pine (fig. 199), grows only within the influence of the sea-breezes, and extends its range to most of the islands of Oceanica, in some of which, as we have before noticed, it forms the staple food of the inhabitants. In addition to the plants above enumerated, we may mention the exocarpus, called by the colonists, from the colour and size of its fruit, the native cherry, but which has the stone placed on the outside; the singularly formed bottle-tree (*delabechea rupestris*), the trunk of which bulges out like a barrel; and the nuytsia floribunda, which presents a most curious instance of a plant belonging to the parasitical order loranthaceæ, growing on the ground. This plant is said to attain the stature of a small orange tree, and such is the abundance of its flame-coloured blossoms, that the colonists at King George's Sound compare it to a tree on fire, from whence it has obtained the name of the "fire-tree." Some plants belonging to the myrteaceæ are remarkable for the fragrance of their leaves; and Professor Lindley mentions one small genus, included among the Swan River plants, to which, from the exquisite sweetness of its foliage, he has given the name *hedaroma*. "The leaves, and especially the half ripe fruit of these plants," he remarks, in speaking of the *hedaromas*, "preserve their fragrance so well, that they might be worth collecting for the use of the perfumer; and if so, they would furnish a new and most agreeable article of luxury to Europe, and a small aid to the natural resources of the colony." The orchidaceous plants are very numerous, and, from the singularity of structure, beautiful forms, large size, gay colours, and fragrance of many species, the whole assemblage is scarcely surpassed by those of tropical countries. The indigenous plants of Australia which are adapted for the food of man, do not appear to be numerous. Among those at present known, the principal are the pandanus, the cycas, and the castano-spermum, or chesnut bean. The fruit or beans of the latter are contained in long pods, and are larger than the Spanish chesnut, to which, when roasted, they are said to approach in flavour. We have seen that the *nymphaea lotus*



Australian Forest Scenery.



forms an article of food, and the root of the bulrush is also eaten. An esculent vegetable is mentioned by Dr. Milligan as occurring in Western Australia, known by the name of "boom," which he describes as a root of a scarlet colour, resembling the bulb of a tulip in size and form. "The natives," he observes, "roast them in the ashes, and then pound them between two flat stones; when thus prepared, they are mucilaginous, and of a glossy black colour; they may be considered as the bread of the natives who live near the sea-coast." In some parts of the interior, the natives form a sort of paste, or bread, of the seed of a species of grass (*panicum laevinode*) which they gather, and collect in heaps, expressly for that purpose.

Among its native animals, Australia possesses a very small number that are of utility to man, this extensive region being apparently entirely destitute of ruminant animals, such as the cow, deer, sheep, &c., and of pachydermatous animals, such as the hog, horse, &c.; whilst four-fifths of its native quadrupeds belong to the order marsupiated. Among the latter, we find the kangaroo (fig. 45), of which there are several species, the kangaroo rat, the wombat (fig. 46), the petaurus, or flying opossum (fig. 47), and the bandicoot—all of which feed principally on leaves and roots of plants; whilst the opossums are carnivorous animals; and among the latter, the thylacurus, and the dasyeurus, or hair-tail, often commit great ravages among the sheep of the settlers.

The Australian quadrupeds also include among their number that very singular animal, the ornithorynchus, or duck-bill (fig. 64); and the echidna, one species of which, the spiny echidna (fig. 65), is covered with prickles, like those of the porcupine. The pteropus, or flying fox, occurs in great numbers in the northern parts of Australia; and the dingo, or native dog, is met with in a wild state in the same districts.

Although the birds of Australia are not so peculiar as its quadrupeds, they include some rare and singular forms. Such are the emu (fig. 126); the black swan (fig. 137); and the menura, or lyre tail. The *tulegalla lathami*, or brush turkey, is not less remarkable for the singularity of its habits. This

bird does not hatch its own eggs, but employs, for that purpose, similar means to those used for artificial incubation. For some weeks prior to the period of laying, it collects together an immense mass of vegetable matter, varying from two to four cart-loads, with which it forms a pyramidal heap; in this heap the hen deposits her eggs, at the depth of about eighteen inches, and from nine to twelve inches apart. The eggs being carefully covered, are then left to hatch by the heat arising from the decomposition of the surrounding matter. These heaps are formed by the united labours of several pairs of birds, and frequently contain a considerable number of eggs. The *leipoa*, or native pheasant, also forms a mound, though not of such large dimensions, in which its eggs are deposited, the nests of the latter bird much resembling ants' nests. The most remarkable nest of this description is, however, that formed by the *megapodus tumulus*, or mound-raising megapode, called the jungle fowl by the settlers of Port Essington, the nests constructed by this bird having long been considered as the tumuli of the aborigines. The late lamented Mr. Gilbert examined one, which was fifteen feet in height, and the circumference of which, at the base, measured no less than sixty feet, the upper part measuring forty feet. It was entirely composed of the richest description of light vegetable mould, there being no other material to keep it warm. He found the temperature within the mound rather above 90° Fahrenheit. After some research, an egg was found at the depth of about five feet; but Mr. Gilbert was unable to ascertain by what means the young bird could effect its escape from this singular nest. These mounds have only been observed in dense thickets, immediately adjacent to the seabeach. But remarkable as are these nests, yet more extraordinary is the "playing ground" of the *chlamydæra*. This bird, called the satin-bower bird, forms what appears to be a hall of assembly, or playing ground. This curious structure is usually placed under the shelter of some overhanging tree in the most retired part of the forest. It is composed of twigs, which are so arranged as nearly to meet at the top; and it is rendered still more interesting by the manner in which it is adorned, at and near the entrance, by the most gaily-

coloured articles the birds can procure, such as the feathers of parrots, shells of snails, &c.* The most beautiful bird known to inhabit this region is the *ptiloris Victoriae*, a newly-discovered species of rifle-bird, the plumage of which is gorgeously coloured; whilst, among the most common birds, we find the various species of the *melliphagous*, or honey-eating family, which feed chiefly on the honey of flowers. Cockatoos, parrots, lorikeets, and parrakeets, are also very numerous, and the latter prove very destructive to the crops of corn. There are several species of king-fishers, and, among the latter, is the *dacelo gigantea*, or great brown king-fisher, which, from its peculiar note, has acquired the absurd name of the "laughing jackass;" and as the traveller wends his way across this extraordinary region, it either seems to greet him with a merry laugh, or, if his course be not so prosperous, it appears to be laughing at his misfortunes;—"its cry," says Captain Sturt, "resembling a chorus of wild spirits, and being apt to startle the traveller who may be in jeopardy." This bird, from its regularity in uttering its cry a little before sunrise and after sunset, has not inaptly been called the settler's clock. Doves and pigeons are very abundant; and some of the species are remarkable for the gorgeous colouring of their plumage; while the fruit pigeons are considered as great delicacies for the table. The bird called the Australian partridge is a species of quail.† Ducks, geese, herons, egrets, cormorants, &c. &c. are numerous, and the great albatross extends its range to the southern shores. In Van Diemen's Land, a species of parrot occurs, called the black-spotted ground parrot, which is remarkable for walking on the ground, and never perching on trees. In the latter island, we also meet with that extraordinary bird, the apteryx. The habits of this bird are entirely nocturnal, in which respect it resembles the marsupial animals, the greater number of which seek their food by night.

Lizards and iguanæ of various species occur in Australia; and Dr. Leichardt met with the crocodile in the more northerly

* Specimens of these playing grounds are preserved in the British Museum.

† Latham states that in China, these birds, as well as the common quails, are used to warm the hands in winter, as may be seen in Chinese drawings.—GOULD'S *Birds of Australia*.

parts, as also with a species of turtle; reptiles, however, do not appear to be numerous, though it has been stated, that an incredible number of snakes have recently made their appearance in Australia Felix.

On the northern coasts, the *trepang*, *beche de mer*, or sea-slug, is very abundant. This singular article of luxury on the table of the Chinese epicure, seems to bear much resemblance, in external appearance, to our large common slugs, the skin of the *beche de mer* being rough and toughish, and there being two species, the one black and the other gray. In length, these sea-slugs vary from eight to twelve inches, and they are about five inches in girth. They are generally found among the sea-weed, or on the sand-flats in shallow water. When taken out of the water, they feel stiff, but their soft bodies consist of a mass of gelatinous substance.

The islands which constitute the territory of New Zealand, consist of two large, and some smaller islands, the surface of which is in extent about equal to that of England and Wales. New Zealand is situated in nearly the same parallel of latitude as the southern districts of Australia, but, owing to the difference in the configuration of its surface, it enjoys a far more temperate climate than any part of that region. Both islands being traversed by elevated mountain ranges, and in most parts covered with forests, and also surrounded by a vast ocean, their climate is rather humid, but remarkably equable, and they neither suffer from parched and burning summers, nor from severe and rigorous winters. The principal mountains in the Northern Island are Mount Egmont, or Taranaki, which is about 8300 feet in height; Ruapahu, which is rather more elevated, and Tongariri, which has an altitude of about 6000 feet.

The line of perpetual congelation extends to about 7000 feet in this territory, and consequently the two former mountains are covered with perpetual snow. These mountains are volcanic, and Tongariri appears to be the centre of volcanic action in this region, elevating its vast truncated cone in the vicinity of the other snow-clad peaks, like a huge caldron, from which volumes of steam, and jets of scalding water, are continually issuing, whilst eruptions of lava are not unfrequent.

On White Island, there is also a volcanic vent, sending forth steam and sulphureous exhalations. A chain of lakes extends through the interior of the northern island; Taupo, the largest, is thirty-six miles long, and twenty-five broad. The mountain chains of the southern island, (sometimes designated as the Middle Island,) are supposed to consist of primary rocks, and the lofty pyramidal summits are covered with perpetual snow. Various ridges diverge from the central group, which are intersected by deep and narrow valleys. Comparatively little, however, is known of this island.

A vast portion of New Zealand is covered with dense forests, yielding both valuable timber and ornamental woods. In the more elevated districts, the beech and some species of pine occur, the only cone-bearing pine, however, being the *dammara Australis*, or kaudi pine, sometimes called the kauri pine, which produces both excellent timber and a fragrant gum resin, equal or superior to gum mastie, and which is an article of great commercial importance. It is usually found in considerable quantities embedded at the base of these trees. The rimu, sometimes called the red pine, the piruri, or iron-wood, the rata and the kohe, are also valuable timber trees. The leading characteristic in the vegetation of this territory, is the preponderance of ferns. "No country in the world," observes Mr. Angas, being "so rich in ferns as New Zealand; the variety and elegance of their forms, from the most minute species to the giant tribe, is astonishing: some attain a height of forty feet, while others of exquisite beauty are extremely small." Among these ferns is included the esculent fern, the roots of which once constituted the main subsistence of the natives. Palm trees occur in the lower districts, and parasitical plants in great numbers are met with in the woods. The *phormium tenax* (fig. 194), commonly called New Zealand flax, is another produce of this region, and, before the introduction of foreign manufactures, was generally employed by the natives for their garments, and various other uses. This plant is remarkable for the strength of its fibre, which forms excellent cordage, though its value for this purpose appears much to depend on the mode of preparation. Whether the native fruits of New Zealand may

be capable of improvement by cultivation remains to be proved, but those found growing wild in the woods are described as by no means agreeable in flavour. All English fruits, however, succeed in this territory, and the climate is also well adapted for the growth of wheat, as well as potatoes, which are said to arrive at singular perfection.

The native animals of New Zealand are few, the only mammiferous animals being, the peka-peka, a small species of bat, and, according to some accounts, the native rat; though it has been supposed that rats had only been introduced by the first ships that touched at the island. No small interest has been attached to the native birds of New Zealand, from the recent discovery in that region of the bones of birds nearly allied to the existing apteryx, but some of which are of gigantic dimensions, to which the name *dinornis giganteus* has been applied; and the question has arisen whether they belong to existing or to extinct species. Although there appears evidence that a large portion of these bones may be referred to a more remote period, yet, from their association in some cases with human bones, there seems reason to suppose that the *moas*, as these birds are termed by the natives, even if now wholly extinct, may have been in existence since these islands were peopled by man: whilst the recent discovery of a second species of *kiwi-kiwi*, or apteryx, (*apteryx Owenii*,) the height of which is said to be three feet, gives colour to the supposition that some of these species may yet inhabit the unexplored recesses of these islands; a supposition which has been still further confirmed by the very recent discovery of a living specimen of the *notornis*, a bird of the rail family, called the *moho* by the natives, and hitherto only known in a fossil state. The apteryx, as we have before seen, in speaking of Van Diemen's Land, is a nocturnal bird, burrowing in the ground during the day, and frequenting the thickest glades of the forest during the night. Among the other birds of this region, we may mention the nocturnal parrot, which, like the apteryx, resorts in the day-time to burrows under ground; the *neomorpha Gouldii*, the tail feathers of which are in great request among the natives, and sent as presents to distant

parts of the island; and the elegant and singular *tui* (*meliphaga concinnata*) which enlivens the woods with its melodious song, and, like the mocking thrush of America, imitates the notes of every other bird in the forest.

Snakes are unknown in New Zealand, and the reptile class is represented only by a small lizard. It is not a little remarkable, therefore, that the natives people Mount Taranaki with crocodiles; and assert that mysterious birds dwell amidst its recesses; the latter possibly may have reference to the gigantic moas.

Nearly due south of the most westerly part of New Zealand is situated the Antarctic mainland, discovered by Sir James Ross on the 12th of January, 1841, and to which he gave the name of South Victoria Land. "It rose," he observes, "in lofty mountain-peaks of from 9000 to 12,000 feet in height, perfectly covered with eternal snow; the glaciers that descended from near the mountain summits projected many miles into the ocean, and presented a perpendicular face of lofty cliffs. We pursued our course along this magnificent land, still steering to the southward, and on the 28th [of January] a mountain of 12,400 feet above the level of the sea was seen emitting flame and smoke in splendid profusion. This magnificent volcano received the name of Mount Erebus; it is in latitude $77^{\circ} 32'$ S., and longitude 167° E. An extinct crater to the eastward of Mount Erebus, of a somewhat less elevation, was called Mount Terror. The mainland preserved its southerly trending, and we continued to follow it, until in the afternoon, when close in with the land, our further progress in that direction was prevented by a barrier of ice: this extraordinary barrier presented a perpendicular face of at least 150 feet, rising, of course, far above the mast-heads of our ships, and completely concealing from our view everything beyond it, except only the tops of a range of very lofty mountains in a south-south-east direction, and in latitude 79° S. Pursuing the examination of this splendid barrier to the eastward, we reached the latitude of $78^{\circ} 4'$ south; the highest we were at any time able to attain." The continuity of this newly-discovered southern land was traced from

nearly the 70th to the 79th degree of latitude. On February the 23rd, 1842, Sir James Ross and his intrepid companions, in the *Erebus* and *Terror*, revisited this spot, but were prevented by the same icy barrier from proceeding more than six miles nearer the South Pole; and $78^{\circ} 10' S.$ was the highest latitude into which the pack or bay ice permitted their advance. This mighty barrier, or cliff of ice, was traced as extending for more than three hundred miles. The appearance of its surface is described as resembling a plain of frosted silver.

The general outline of the Antarctic continent indicates its volcanic character; "it rises steeply from the ocean in a stupendous mountain range, peak above peak, enveloped in perpetual snow, and clustered together in countless groups, resembling," observes Mr. McCormick, "a vast mass of crystallization, which, as the sun's rays were reflected on it, exhibited a scene of such unequalled magnificence and splendour, as would baffle all power of language to portray or give the faintest conception of." Lateral ridges extend from these mountains to the borders of the sea, terminating abruptly in bold capes and promontories, and presenting such steep escarpments, that their perpendicular sides afford no resting place for the snow, and the black lava, or basalt, of which they are formed, being thus left bare, contrasts strikingly with the snow-clad surface around. We have already met with some notice of Mount Erebus and Mount Terror; in the more northerly portion of this range, the pointed summit of Mount Monteagle, and the immense crater of Mount Melbourne, form two of the more remarkable objects in this most wonderful and magnificent mass of volcanic land.

Not the smallest trace of vegetation was observed in these extreme southern lands, not even a lichen, or piece of seaweed, growing on the rocks; but, in the animal kingdom, marine mammalia, birds, fish, and also articulated and moluscous animals, were met with. Among the first, are various kinds of seals and whales; among birds, are several kinds of petrel, and of penguin, both of which occur in great numbers; whilst the fish are represented by the *notothenia phocæ*, which

occupies the place of the *merlungus polaris* of the Arctic seas. Speaking of the notothernia, Sir J. C. Ross observes, "the seals and petrels are their chief enemies, while they, in their turn, live upon the smaller cancri and limalinæ. Thus, we behold, in these regions, where the vegetable kingdom, which constitutes the support of animal life in milder climates, has no representative, a chain of animal existences maintained by each preying upon that next below it in the order of created beings, and all eventually nourished and sustained by the minute infusorial animalcules which we found filling the ocean with an inconceivable multitude of the minutest forms of organic life."

The islands of Polynesia, which occupy so large an expanse of the Pacific Ocean, may be divided into three classes,—the *mountainous*, the *hilly*, and the *low* islands. The *mountainous* islands are evidently volcanic, and vary in height from 2000 to 15,000 feet. They are exceedingly picturesque in their appearance, combining the grand with the beautiful, the country at the base of the mountains usually presenting a series of fertile valleys covered with the most luxuriant vegetation and magnificent trees. The *hilly* islands are of coral formation, and appear to have been raised above the waters of the ocean by some elevatory movement. Their general character is that of fertility and beauty, but they do not possess the grand scenery of the mountainous islands. The third class comprises the *low* coralline islands, which are mostly of small extent, and only a few feet above the level of the ocean. The soil on the latter islands is usually of little depth, and therefore scarcely any trees are capable of thriving in these newly-risen islands. The cocoa-nut palm and the pandanus are, however, remarkably and beautifully adapted to take root and flourish in such situations; and, accordingly, we find these trees among the first occupiers of the soil. The admirable provision by which these islands become suitable for the habitation of man is strikingly apparent in this process; the seeds of these plants, protected as they are by a thick, but light shell, are capable of floating to a distance on the surface of the waves, and of being thus lodged uninjured on the newly-formed island. The roots of these trees are so

remarkably hard, that they have the power of forcing their way among the interstices of the coral rocks: and both species are particularly adapted to thrive within the influence of the sea air. No sooner does the cocoa-nut cover an island, than man may be supported on this spot; for that valuable tree furnishes him with food, clothing, sails, cordage, timber, materials for thatching his dwelling, &c.

The Friendly Islands, with the exception of the small active volcano of Tofua, consist entirely of low coralline islands. Tongataboo, the largest of the group, and indeed of the whole class, is not more than one hundred miles in circumference. In some instances, as in the group appropriately called the Dangerous Archipelago, these islands are partially covered by the waves, offering considerable impediments to navigation. In other parts, extensive coral reefs extend, either encircling the islands, and forbidding approach, or affording protection to the harbours.

The Society Islands are a very beautiful and fertile group, some of which belong to the mountainous, and others to the hilly class. Tahiti, or Otaheite, the largest of the group, which is of igneous origin, is a singularly beautiful island, containing grandly-formed mountains, the most elevated of which, named Oreana, rises to the height of about ten thousand feet above the level of the sea. Numerous cascades pour down from these elevated and picturesque mountains; and the scenery at their base is described as consisting of a succession of deep valleys, or glens, richly clad, in the interior, with graceful arborescent ferns and other tropical plants, and near the shores, with groves of cocoa-nut palms; whilst "the deep blue of the surrounding ocean, contrasted with the white foam of the breakers, dashing against the extensive coral reefs, completes the beauty of the scene." The Sandwich Islands, which are rather detached from the other groups, appear to be of volcanic origin, and Hawaii, or Owhyhee, may be considered as forming the centre of this volcanic region. The general aspect of these islands is that of boldness and sublimity.

The intertropical situation of the Polynesian Islands subjects them to the most intense action of the sun's rays, but the

nature of their soil renders them healthy. Surrounded, too, as they are, by a vast expanse of ocean, and in some instances diversified by elevated mountains, they enjoy a delightful climate; and, excepting the newly-formed coral islands, are furnished with abundant supplies of water; the climate of the latter, however, is tempered by the sea breezes. The beneficial effects resulting from the combination of heat and moisture are evinced by the varied and luxuriant vegetable productions of these islands, which, indeed, are ranked among the most delightful and smiling regions on the surface of the earth.

Not only is the flora of Polynesia varied and beautiful, but also remarkably redundant in plants adapted to the sustenance of man. Allusion has already been made to the cocoa-nut, so valuable to the inhabitants of the low coral islands: the mountainous districts possess a plant of at least equal value, in the bread-fruit tree (fig. 96), which has been called the staff of life of the Polynesians. This beautiful tree bears three or four crops in the year; and, as there are several species, which ripen at different seasons, a constant supply is provided during the greater part of the year. The leaves also afford fodder for cattle; the bark is woven into cloth, the trunk yields valuable timber, and the sap answers all the purposes of pitch. Both the banana and plantain, here called the maia, are indigenous to these islands; and the mapu, or native chesnut, is another useful production. The yam, which is afforded by the root of the *Dioscorea alata*, also ranks high among the esculent plants of these islands. Besides these, we meet with taro, which is the root of the *Arum esculentum*; pia, that of the *Cheila tacca*; and three species of ferns, which are useful for food. The sugar-cane is a spontaneous production; and there are several kinds of excellent fruits. The paper mulberry (fig. 92) is woven into cloth for garments; and the leaves of the pandanus are used in forming the beautiful finely-plaited mats, made by the Polynesians. A remarkable tree, called the tuitui, or candle-nut tree, abounds in the mountains, bearing nuts about the size of a walnut, which are used by the natives as candles. Having stripped off the shell, they perforate the kernel, and

string a number of these on a rib of a cocoa-nut leaflet, and then light them. The tree also furnishes a substitute for painting oil, and for varnish.

Such are a few of the fruits of the earth showered by the Creator on these favoured regions, where, if man be silent in His praise, well may we exclaim,

Soft roll your incense, herbs, and fruits, and flowers,
In mingled praise to Him, whose sun exalts,
Whose breath perfumes you, and whose pencil paints.

But ere we condemn the thoughtless unconcern of too many of the untaught inhabitants of these regions, let us look at home, and consider whether we, who regard ourselves as possessing every advantage of instruction, who also regard ourselves as the "chief" among God's works, "for whom the whole creation smiles;" how far, whilst assuming to ourselves the character of "the head," we are ready both to acknowledge the source from whence all we enjoy is derived, and to exercise our privilege of acting as "the heart, the tongue of all."

The Polynesian volcanic region demands a brief attention. Australia appears to present few indications of volcanic energy, though, as already mentioned, extinct craters have been observed in the south-eastern districts, and also in some other localities; and repeated shocks of an earthquake occurred in August, 1827, in Melville Island, situated near Port Essington, on the northern coast. A slight shock was also felt at Vittoria, in the same locality, on the 30th of June, 1841, and according to Mr. Earle, the natives state that they are not unfrequent; they say that they are caused by the Malays dancing! "What on earth can they mean?" observes Mr. Earle.

New Zealand, as we have already seen, contains several active volcanos: and the immense area,

Where the vast Pacific smiles,
Round ten thousand little isles,

appears to be one theatre of volcanic action; a considerable proportion of the islands being, as already mentioned, composed of volcanic rocks; whilst active vents are interspersed

at intervals,* and the whole region is subject to earthquakes. Indeed, this is a remark which may be extended to the whole Pacific Ocean. In the north are the Aleutian Isles; in the east, the Galapagos, and other volcanic groups; in the west, the Kurile Isles, Japan, and the whole Asiatic volcanic band; whilst in the south we meet with the magnificent volcano named Mount Erebus, already alluded to as having been discovered by Sir James Ross on the 28th of January, 1841, and there appears reason to conclude that the convulsions in the Polynesian Archipelago are more or less connected with those in the volcanic region of the Andes.

We cannot pause to consider all the features of the Polynesian volcanic region, but must confine our attention to the island of Hawaii (called Owhyhee by Captain Cook), the largest of the Sandwich group. This island appears to consist of one mass of volcanic matter, in various states of formation and decomposition. It contains three remarkable mountains—Mowna Koa, Mowna Roa, and Kiraueh. Mowna Koa is a volcanic cone, rising, by a gentle ascent, from Byron's Bay, to the elevation of 18,400 feet. Mowna Roa, which is 16,000 feet in height, contains at its summit a vast crater, six miles in circumference; but the mountain of Kiraueh, although not 4000 feet in elevation, is the most remarkable in this island, on account of the striking volcanic phenomena it exhibits.

The crater of Kiraueh consists of a vast sunken pit, nearly oval in form, and with almost perpendicular sides. This volcano is prodigiously active; but no great eruption has taken place since the year 1787, at which period one of the most tremendous description occurred, lasting for seven days and nights, and on that occasion, above five thousand of the natives, who were marching to war, all perished. A less violent eruption took place at a new vent near this mountain, in 1832, when the earth opened and emitted liquid lava, a large portion of which was discharged into the crater of Kiraueh. The vegetation on the sides of the mountain at first appeared to have been wholly destroyed by the igneous

* A new volcano burst forth in the island of Amargoura, one of the Friendly Group, on the 11th of July, 1847.

matter; but about eighteen months afterwards, the ferns sent forth new and more than usually vigorous fronds.

The late Mr. Douglas,* who visited Kiraueh in 1833, has described the scene presented by the interior of its crater as singularly awful and magnificent. He descended to a ledge at the depth of 1062 feet in this fearful pit; where a space, about five miles in diameter, was covered with lava, the whole of which had apparently been recently in a state of fusion, though some portion was at that period hardened. This igneous mass appeared, in the process of cooling, to have been rent into pieces of every form and size, from gigantic rolls, like enormous cables, to the finest threads. Over this part of the pit were dispersed numerous small cones or chimneys, which continually emitted smoke; and besides these little cones, there were three remarkable pyramidal masses, measuring about 900 feet at the base, and being from 20 to 25 feet in height. These cones had lateral openings, like the doors of a baker's oven, to which they altogether bore a close resemblance. By kneeling down on the ledge, it was possible to peep into these openings, and to witness "a terrific vacuity, a red hot atmosphere," varied only by the occasional ejection of volcanic matter through a lateral opening. The remaining portion of this pit consisted of two lakes of liquid lava; one about 900 feet in diameter, and the other above 3000 feet in length, and nearly 2000 in width. Both these lakes of fire flowed in a continued stream towards the south end of the pit, at which point was exhibited one of the most appalling and magnificent spectacles in nature,—a vast caldron of lava, in furious ebullition, rolling and tumbling in fiery waves, sometimes spouting up to the height of 60 or 70 feet, and rapidly hurrying along, until it precipitated itself through an arch about 400 feet in width, and 40 in height, into a yawning chasm of unknown depth. From this tremendous, but unseen laboratory of nature, immense masses were thrown back with great violence, and literally spun into minute glass-like filaments, which were carried by the wind in all directions.

* It was in Hawaii that this promising naturalist met with his untimely death; he was killed by a furious bull, whilst pursuing his botanical researches.

The sound issuing from this archway baffled all description ; "that of the whole steam-engines in the world," says Mr. Douglas, " would be a whisper to it."

The phenomenon of an earthquake-wave occurred in this and some of the adjacent islands on the 7th of November, 1837. At Byron's Bay, in Hawaii, the sea first retired, leaving a large portion of the harbour dry. Hundreds of persons rushed down to the beach to witness the novelty, when a gigantic wave came roaring to the shore, on which it fell with a noise resembling a heavy peal of thunder ; and, rising 20 feet above high-water mark, it overwhelmed everything in its way,—houses, trees, cattle, and the unfortunate crowd of spectators ; then again retiring, it carried out to sea a vast quantity of goods, and a considerable number of men, women, and children, who all would have met with a watery grave, but for the timely assistance of a British whaler at anchor in the bay. Fourteen individuals, however, perished ; and the destruction of property was very great. No shock of an earthquake was felt on shore ; but Kiraneh was unusually agitated on the preceding evening, the fires having been suddenly extinguished, and yawning chasms having burst forth in previously tranquil places ; the latter commotions being accompanied with loud detonations.

WE have now completed our brief survey of the leading features of the Earth as it is : necessarily—from the narrow limits we have prescribed to ourselves, though yet more, from the vast magnitude of the theme—falling infinitely short of its mighty capabilities. We earnestly hope, however, that enough may have been said to inspire our readers with a desire of pursuing into further details, a subject at once so interesting and so important. Happy should we be, could we have succeeded in leading one individual mind to the perception of the manifold works of God, and of the wisdom with which they are all made, or in strengthening an already received impression, that the earth is full of His riches ; could we have conveyed the slightest intimation of the order, beauty, and harmony of the whole—where link unites with

link, and all combines to form one unbroken chain, one grand and comprehensive system.

. Among themselves all things
Have order; and from hence the form, which makes
The universe resemble God. In this,
The higher creatures see the printed steps
Of that Eternal Worth, which is the end
Whither the line is drawn.

This order, this harmony, and bond of union, so manifestly and beautifully displayed in the natural world, may also in some measure be found to exist in the busy world, where man forms the principal actor: and where all, in their several vocations, may not unfrequently, though sometimes, perhaps, unwittingly, reciprocally aid each other, whilst the whole is overruled to the benefit of the human species. In nothing is this more evident, than in all endeavours to extend our knowledge of the earth's surface. Science, and more especially geographical science, or Physical Geography, here leads the van; the scientific traveller is the first to penetrate into unknown and barbarous regions, often pursuing his course amid privations and dangers, which zeal and perseverance alone can enable him to encounter or overcome. His researches open the field for the devoted messenger of religion, by whose means friendly intercourse is established with the natives, and light and civilization introduced. A mart is thus opened for the wares of the merchant; for, as soon as a barbarous people become civilized, they require clothing, utensils, and other manufactured articles; and thus, not only is our commerce extended, but employment is also afforded for our manufacturing population at home. The intelligent missionary, again, residing in unknown lands, possesses frequent and favourable opportunities of adding to our stores of scientific knowledge, whilst the merchant spreads this information, and the benefits accruing from it, over the surface of the globe.

Nor are these the only advantages resulting from this friendly intercourse. Whilst we are the instruments in diffusing the blessings of peace and the glorious light of Christianity, among the benighted inhabitants of remote and barbarous climes, the blessings are returned upon ourselves, on

our own brave countrymen. "Wherever the missionary succeeds in obtaining even the slightest influence," says Captain Fitz-Roy, "there may the seaman go in safety." And, that such happy results may be of permanent duration, has been recently shown in so decided a manner in the Moluccas, that we cannot refrain from inserting the account. Some of these islands are still in heathen darkness, but others have long since embraced Christianity; and on one of the latter islands, *which had not been visited by any European for fifty years*, a great number of the inhabitants were recently found still to retain their religion, having small churches, in which native preachers officiated. The inhabitants of Vordati are, however, still unenlightened; and in 1827, a vessel which touched at that island in quest of provisions was seized by the natives, and all the crew, with the exception of two youths, who were saved by the women, were inhumanly massacred. The inhabitants of the island of Kissa, on the contrary, are Christianized; and not long since, two English seamen, who had been cast away on the shores of New Guinea, and had been sold and re-sold among the heathen tribes, were purchased by the Christian Chief of Kissa, who not only gave them their liberty, but brought them to Banda, where they were received on board a trading vessel, and enabled to return to their native country.

Such considerations, combined with others already adduced in a former page, cannot but lead us to regard Physical Geography as a science eminently calculated to impart benefit to man, both as an individual and as a social being. The path of "Creation's golden footsteps," into which this science conducts us, also guides directly to the divine Author of Nature. There are "laid before us," says Bacon, "two books or volumes to study; first, the Scriptures, revealing the will of God; and then, the creatures, expressing His power, whereof the latter is a key to the former; not only opening our understanding, but opening our belief; in drawing us into a due meditation of the omnipotency of God, which is signed and engraven on his works."

It is not, however, "Omnipotency" alone that is "signed and engraven" on the works of nature: Providential care and Infinite goodness are also inscribed in glowing characters: in

many instances, in characters so plain that "he who runs may read;" but in others, displayed only by the aid of scientific investigation. The latter circumstance palpably shows the great advantage of our present science; for,

Goodness, inasmuch as we perceive the good,
Kindles our love; and in degree the more,
As it comprises more of goodness in it.

And finally, the contemplation of so much that is lovely, so much that is excellent, has, when considered with reference to Him from whom it all proceeds, a direct tendency to improve and elevate the character; whilst the habitual acknowledgment of the hand of the Most High, in these His visible works, cannot fail to confirm and strengthen our trust and reliance in Wisdom, Power, and Goodness so infinite.

INDEX.

- AARD-WARK**, 103, 293
Aard wolf, 293
Abyssinia, 280, 289
Acacia Arabica, 211
 — **Australian**, 385
 — **False, or Robinia**, 69, 317
Aconcagua, 362
Adansonia, 67, 298
Adaptation of species to their station, 115
Adelaide Island, 349
Adelsberg, cavern of, 163
Adessa, valley of, 143
Adjutant, 234
Advantages of Physical Geography, 3
Africa, 279
 — **Eastern**, 280
 — **Northern**, 280
 — **Southern**, 280
 — **Western**, 281
African custard apple, 298
 — **earth-nut**, 298
 — **locust tree**, 298
Agal-agal, 242, *note*
Agave, 352
Agouti, 360
Air, constitution of, 32
Albania, 165
Albatross, 389
Alder, 186
Aleutian Isles, 253
Alfourou race, 112
Algazel, 293
Alleghany Mountains, 307
Alligator, 94, 343
Allspice, 359
Alluvial soil, 10
Almond, 135, 171
Aloe, 212, 289
 — **American**, 352
Alpine hare, 182
Alps, 16, 151, 157
 — **Carnic**, 162
 — **Cottian**, 158
 — **Dinaric**, 165
 — **Graian**, 158
 — **Helvetian**, 159
Alps, Julian, 162
 — **Maritime**, 161
 — **Noric**, 162
 — **Pennine**, 158
 — **Rhætian**, 161
Altai Mountains, 243, 247
Alyaska, 46, 253
Amanus, Mountains of, 199
Amargoura, 401, *note*
Amazonas, or Marañon, basin of, 343
Amazonas, river of, 28
Amboyna, 241
America, 306
 — **Central**, 49, 350, 354
 — **North**, 306
 — **South**, 323
American languages, 113
 — **locust tree, or false acacia**, 69, 317
 — **race**, 111, 112
Amorgos, 63
Amphibia (mammalia), 102
 — **(reptiles)**, 94
Anaconda, 348
Analogy of languages, 114
Anatolia. See Asia Minor.
Andes, 14, 16, 323, 361
Anemone, 172
Angola sheep, 106
Animals, geographical distribution of, 81
 — **key to plate of**, 77
Anna Bom, island of, 305
Anomalous races, 111
Antarctic regions, 349, 393
Ant-bear, or Ant-eater, 103, 347
 — **African**, 103, 293
Antelope, 106, 283, 293
Antiparos, grotto of, 169
Antisana, 230, 365, 367
Ants, white, or Termites, 156, 300
Apennines, 151
Apricot, 214
Apteryx, 391, 394
Arabia, 209
 — **sand-hills in**, 210
 — **Petrea**, 206

- Aracan, 225
 Arak-tree, 210
 Aral, lake of, 15, 25, 247
 Araponga, or Bell-bird, 346
 Ararat, 214, 263
 Araucaria excelsa, 385
 Araucarian or Chili pine, 325
 Arbor vitæ, 317
 Arborescent fern, 68, 229, 333, 393, 398
 Arbutus, 130
 Arcadia, 166, 173
 Arched squalls, 43
 Arctic bramble, 180
 ——— fox, 101, 251, 320
 Argæus, Mount, 196, 265
 Argali, 106
 Aristolochia, 67
 Armadillo, 103, 347
 Armenia, 212, 263
 Arnee, 106
 Arnotto dye, 342
 Aromata, Terra, 290
 Arran, isle of, 124
 Arrow-root, 360
 Articulata, 85
 Arum esculentum, 289, 399
 Asam, or Assam, 225
 Ascension, island of, 51, 302
 Ashantee, 297
 Asia, central band of mountains in, 196
 Asia Minor, 196, 265, 275
 Asphaltites, Lake, 26, 200, 264
 Asphaltum, 262, 359
 Ass, 105
 ——— in India, 238
 ——— wild, of the desert, 246
 Assam. See Asam,
 Astragalus, 172
 Atlas Mountains, 14, 280, 285
 Atmosphere, 32
 Attalea, 342
 Australia, 376
 ——— Eastern, 376
 ——— Southern, 381
 ——— Western, 383
 ——— burning mountain in, 378
 Australian race, 112
 Auvergne, mountains of, 147
 Azerbaijan, 261
 Azof, sea of, 264
 Azores, 274, 303
 BABEL, Tower of, supposed remains of, 262
 Baboon, 99, 293
 Babylon, hanging gardens of, supposed remains of, 217
 Babyroussa hog, 241
 Badger, 100
 Baikal, lake of, 26
 Baku, or Field of Fire, 261
 Balkan Mountains, 165
 Balm, or Balsam, 212
 Bamboo, 223, 229
 Banana, 73, 346
 Banca, isles of, 236
 Bandicoot, 387
 Banksia, 385
 Banyan-tree, 230
 Baobab-tree, 67, 298
 Barbary, 273, 285
 ——— dog, 108
 Barbur, 290
 Barley, 76, 134, 192, 228
 Barometer, its mean height in London, 33
 ——— its use in measuring heights, 32
 Barren grounds, 312
 ——— Island, 254
 Bat, 99, 240
 Bath, hot springs of, 31
 Bay-tree, 154, 166
 Bear, 100, 182, 246, 254
 ——— grizzly, 310
 ——— maritime, or polar, 100, 251, 320
 Beaver, 148, 311
 Beche de mer, 84, 392
 Belgium, 175
 Bell-bird, 348
 Beloochistan, 219
 Belor Mountains, 243, 246
 Ben Macdui, 123
 ——— Nevis, 123
 Bernard, Great St., 158
 Bernardin, St., 161
 Bertholetia, 346
 Betel-nut palm, 225
 Bigg, or Bere, 134
 Bimana, 109
 Biot, M. Ascent in balloon, 8
 Birch-tree, 68, 133, 179, 251
 Bird of Paradise, 95, 241
 Birds, geographical distribution of, 96
 Birman empire, 225

Birs Nimrood, 263
 Biscoe's Range, 349
 Bison, 106, 320
 Bitumen, fountains of, near Hit, 262
 Bixa orellana, 342
 Black Forest, 163
 — spruce, 317
 Blanc, Mont, 158
 Boa constrictor, 94, 348
 Boar, wild, 178
 Bohemia, 18, 163
 Boiling-point of water, 33
 Bolivia, 326
 Bombax, or Ceiba, 298, 342
 Boom, 389
 Borneo, 237, 238, 239, 254
 Boschisman race, 112
 Botany of Africa, Eastern, 291
 — Northern, 288
 — Southern, 291
 — Western, 297
 — America, North, 310, 317
 — Arabia, 211
 — Armenia, 214
 — Asam, 225
 — Asia Minor, 199
 — Australia, 384
 — Brazil, 345
 — British Isles, 129
 — Calabria, 154
 — Central America, 356
 — Chili, 325
 — China, 223
 — East Indian Archipelago,
 236
 — Egypt, 289
 — Etna, 153
 — France, 147
 — Germany, 177
 — Greece and Turkey, 171
 — Guiana, 341
 — Himalaya Mountains, 228
 — Hindostan, 227
 — Iceland, 192
 — Indo-Chinese countries,
 225
 — Italy, 153
 — Japan, 235
 — Madagascar, 300
 — Malta, 156
 — Morocco, 285
 — Mexico, 351
 — New Zealand, 393
 — Palestine, 201

Botany of Persia, 219
 — Polynesia, 399
 — Russia (European), 179
 — Scandinavia, 185
 — Siberia, 248
 — Sicily, 152
 — Spain and Portugal, 145
 — Switzerland, 159
 — Syria, 199
 — Teneriffe, 302
 — Tibet, 244
 — West Indies, 359
 Bourbon, Isle of, 301, 304
 Bouro, 241
 Boussingault, M. and Colonel Hall,
 ascent of, on Chimborazo, 33
 Bower-bird, 390
 Brahmany bull, 233
 Brazil, 343
 — nuts, 346
 — wood, 346
 Brazilian porcupine, 347
 Bread-fruit tree, 73, 399
 Britain, rain in, 38
 British Isles, 117
 — climate of, 128
 Brocken, 163
 Brush turkey, 389
 Buck-wheat, 160
 Buenos Ayres, 20, 345
 Buffalo, 106, 233, 354
 Bulgaria, 170
 Bulimus, 85
 Buried city in Egypt, 288
 — India, 258
 Burning mountain in Australia, 378
 Bute, 124
 Butter-tree, 299
 CABBAGE PALM, 238, 384
 Cabool, 220
 Cacao, or Chocolate-tree, 342, 356
 Cactus, 64, 289, 325, 351, 353
 Cader Idris, 18
 Calabash-tree, 359
 Calabria, 154, 268
 California, 307, 308
 Camaroon Mountains, 281
 Camboge, or Gamboge, 225
 Camel, 212, 288, 290
 Camphor-tree, 237
 Canada, 312
 — balsam-fir, 318
 Canary Islands, 302, 305

- Candia, or Crete, 169
 Candle-nut-tree, or tai-tui, 329
 Cantabrian Mountains, 144, 145
 Caoutchouc-tree, 346
 — fig-tree, 236
 Cape ant-eater, 103, 293
 — buffalo, 106, 293
 — Verde, 261, 297
 — Islands, 51, 302, 305
 Caper plant, 154
 Capromys, 103
 Capybara, 98, 347
 Carabou, or American rein-deer, 311
 Caraccas, 334, 373
 Caribbean Sea, 369, 373
 Carlsbad, springs of, 31
 Carnivora, 99
 Carob, or Eastern locust-tree, 145, 295
 Carolina, 375
 Carpathian mountains, 164
 Cascades, 28
 Caspian Sea, 15, 246
 — volcanic region from, to the
 Azores, 261
 Cassava root, 73, 347
 Cassowary, 241
 Casuarina, 237, 385
 Catamountain. See Ocelot
 Cataracts, 28
 Cat, 102, 240
 Caucasian race, 110
 Caucasus Mountains, 218
 Caviare, 247
 Cavy, 103, 347
 Cayman, or Kaiman, 94, 343
 Cedar of Lebanon, 199, 261
 — Mountains, 281
 Ceiba, or Bombax, 298, 343
 Celebes, 236, 254
 Centipedes, 85
 Central America, 49, 350, 354
 Cerastes, 94
 Cerealia, 75
 Cervin, Mont, 158
 Cetacea, 107
 Cevennes Mountains, 146
 Chacma baboon, 293
 Chameleon, 94, 206
 Chamois, 98, 161
 Cheiroptera, 99
 Chesnut, 145, 154
 — bean, 386
 Chetah, 101, 233
 Chetodon, 22
 Chili, 324, 362
 Chilian pine, 325
 Chiloe, Island of, 324
 Chimborazo, 33, 329
 Chimpanzee, 300
 China, 222, 256
 Chinchilla, 326
 Chinese language, 114
 Chippewyan Mountains, 306
 — Fort, 45
 Chlamyphorus, 103, 347
 Chocolate-tree, 342, 356
 Chota, Valley of, 330
 Cinnamon, 286
 Citron, 346
 Civet, 100
 Clarence peak, 281
 Climate, 44
 — excessive, 46
 — insular, 46
 — of the British Isles, 128
 — China, 225
 — Fort Chippewyan, 45
 — Labrador, 45
 — Sitka, 45
 Clio, 84
 Clouds, 38
 Clove, 237
 Clover, white, remarkable appearance of, 134, note
 Coal-vein in Cuba, 358
 Coati-mondi, 347
 Cobi, or Gobi, desert of, 245
 Cobra da Capello, 94, 234
 Cochín-China, 225
 Cochineal insect, 363
 Cocoa-nut palm, 73, 296, 397
 — double, or cocos de mer,
 301
 Cod, 91
 Coffee, 211
 Colchis, 199
 Colchos, 218
 Colombia, 329
 Colour of skin in human species, 110
 Columbo root, 291
 Concepcion, 325, 365
 Condor, 326
 Continents, 14
 Convolvulus batatas, 73, 347
 Coquimbo, 225
 Coquinas, hot springs at, 31
 Coral insects, 82, 357
 — islands, 357, 395

- Cordilleras of the Andes, 323
 Cork-tree, 145
 Coromandel coast, 226
Corypha umbraculifera, 67, 230
 Coseguina, 369
 Cotopaxi, 329, 367
 Cotton plant, 155, 224, 319
 Cougar. See Puma
 Cow kind, 105
 — in Finland, 190
 — in South America, 109
 — tree, 337
 Cranberry, 181, 310
 Cretan sheep, 173
 Crete, or Candia, 169
 Crimea, 178
 Crocodile, 94, 288, 339
 Cross-timber in Texas, 311
 Crowberry, 189
 Cryptogamic plants, 189, 319
 Cuba, 357
 Cuckoo, 97, 233
 Cucumber, 214, 290
 Cudbear, 189
 Cumana, 56, 334, 373
 Currents of the Ocean, effects of, on climate, 53
 Cusco, 327
 Custard apple, 298
 Cattle fish, 84
 Cycas, 239, 386
 Cyclades, 169

 DACELO, 391
 Dahlia, 352
 Dalmatian Mountains, 165
 Dangerous Archipelago, 398
 Danube, valley of, 163
 Date palm, 73, 205, 283
 Daviesa, 385
 De Humboldt, ascent on Chimborazo, 33
 Dead Sea, 26, 303, 364
 Deception Island, 361
 Delabechea, 386
 Demavend, 218, 260
 Denmark, 175
 Deserts of Africa, 281, 283
 — Arabia, 210
 — Cobi, 243
 — India, 227
 Dew, 35, 338
 Dhawala-girl, 222
 Dhoorah, 74, 236

 Diamond, 234, 236, 244, 344
 Didelphys, 104
 Digitigrada, 100
 Dinaric Alps, 165
 Dinornis, 394
 Distribution, general, of land and water, 12
 — of animals, 81
 — of plants, 62
 Doirasfeld Mountains, 168
 Doirines. See Doirasfeld.
 Dog, 101, 140, 252, 367
 Dolphin, 107
 Donga Mountains, 290
 Donkiah Mount, lichen on, 70
 Doom-palm, 291
 D'Or, Mont, 147
 Double cocoa-nut, 301
 Douglas pine, 310
 Dragon's blood, or gum dragon-tree, 301, 302
 Dromedary, 213
 Drontheim, 75, 183
 Dugong, 107
 Dukhan, or Deccan, 296
 Dwarf-palm, 148
 — willow, 180, 195
 Dziggiai, or Mongolian horse, 105, 246

 EAGLE, 96, 133, 164
 Earth, its position in the universe, 6;
 figure, 6; magnitude, 8; spherical form, 8; motion, 8; density, 9;
 rocks on its surface, 9
 Earthquakes, their origin, 11
 — in Aleutian Islands, 253
 — Algiers, 278
 — Armenia, 263, 274
 — Asia Minor, 265, 275
 — Ava, 258
 — Azores, 274
 — Barbary, 278
 — Bengal, 258
 — British Isles, 277
 — Cairo, or Kahiro, 265
 — Calabria, 266, 271
 — Caraccas, 278
 — Carolina, 276
 — Cartago, 271
 — Central America, 270
 — Chili, 264
 — China, 266
 — Colombia, 267

Earthquakes in Concepcion, 363, 365

- _____ Constantinople, 265
- _____ Croatia, 266
- _____ Cumana, 373
- _____ Cutch, 259
- _____ Cyprus, 257, 265
- _____ Egypt, 265
- _____ Fia, 273
- _____ Fiume, 266
- _____ Formosa, 254, 256
- _____ France, 277
- _____ Germany, 277
- _____ Greece, 265
- _____ Grecian Archipelago, 265
- _____ Greenland, 276
- _____ Guatemala, 369
- _____ Hindostan, 258
- _____ Iceland, 276, 277
- _____ Ionian Islands, 266
- _____ Istria, 266
- _____ Jamaica, 374
- _____ Japan, 254
- _____ Java, 254
- _____ Kamtschatka, 253
- _____ Kumaon, 260
- _____ Kurile Isles, 253
- _____ Lima, 367
- _____ Lisbon, 273
- _____ London, 278
- _____ Morocco, 273
- _____ Melville Island, 404
- _____ Mississippi, valley of, 378
- _____ Mitylene, 265
- _____ Morea, 266
- _____ Mount Ararat, 264
- _____ New Madrid, 374
- _____ Oxus, valley of, 260
- _____ Palestine, 264
- _____ Peru, 367
- _____ Philippines, 254
- _____ Polynesian Archipelago, 395
- _____ Portugal, 273
- _____ Quebec, 375
- _____ Riobamba, 363
- _____ Scotland, 279
- _____ Sicily, 268
- _____ Spain, 273
- _____ St. Domingo, 374
- _____ Syria, 264
- _____ Valparaiso, 363
- _____ West Indies, 374

Earthquakes in Zante, 266

- _____ progressive, 256, 274
- Earthquake waves in Chili, 365**
 - _____ Hawaii, 403
 - _____ Lisbon, 273
- Ebony, 301**
- Echidna, 103, 389**
- Economic mouse, 252**
- Edentata, 103**
- Egypt, 287**
- Eider duck, 192**
- Elburj Mountains, 218, 260**
- El Dorado, 338**
- Electric eel, 343**
- Electricity, its effects on rocks, 10**
- Elephant, 104, 225, 288**
- Elevation of land, its influence on climate, 47**
- Elk, 106, 190**
- Elm, 69, 179**
- El Tyh, desert of, 209**
- Emu, 95, 389**
- Enderby's Land, 349**
- Engallo, 104**
- England, 118**
 - _____ easterly winds of, 52
 - _____ temperature of, 56
- Entomological regions, 88**
- Equatorial current, 53**
- Equinoctial America, vegetation in, 333**
- Erebus, Mount, 395**
- Ermine, 100, 140, 251, 320**
- Erratic blocks, 176, 179**
- Eruption of fishes, 368**
- Erzgebirge Mountains, 163**
- Erzurum, 218, 217**
- Esequibo, basin of, 338**
- Ethiopian, or Negro race, 110**
- Etna, 16, 152, 271**
 - _____ glacier on, 272
- Eucalyptus, 378, 385**
- Euphorbia, Cape, 292**
- Euphrates, 214**
- European Lowland, 174**
- Evaporation, 35**
- Excessive climate, term described, 46**
 - _____ of Fort Chippewyan, 45
 - _____ China, 56, 225
 - _____ Wallachia, 170
- Exocarpus, 386**
- FAIRWEATHER, MOUNT, 375**

- Falcon, 96
 Families of Languages, 118
 Fan palm, 67, 230
 Faroe Islands, 191
 Fernando Po, 281
 Ferns, 398
 — arborescent, 64, 229, 333, 393
 Field of Fire, 261
 Fig-tree, 148, 202
 — sycamore, 205
 Finland, 185
 Fir-trees, 68, 186
 Fish, geographical distribution of, 90
 Fishes, eruption of, 368
 Flamingo, 156, 348
 Flax, 180
 — New Zealand, 393
 Flying cat, 99, 240, 242
 — fish, 92
 — lizard, 241
 — opossum, 387
 Fogs, 37
 — stationary, 38
 Formosa, Island of, 223, 254
 Fort Chippewyan, climate of, 46
 Fox, 101
 France, 147, 277
 Frankincense, 212, 290, 298
 Fredonia, springs of inflammable gas
 near, 375
 Friendly Islands, 396
 Frogs, 94, 348
 Fuentarabia, or Fontarabia, 142
 Fungi, 319
 Fur-bearing animals, 251, 320
 Fuschia, 324
 GALAPAGOS, 401
 Gallols, salt mines of, 177
 Gallipoli oil, 155
 Gamboge, 225
 Ganges, valley of, 228
 Gaseous exhalations in China, 257
 — near Fredonia,
 375
 Gavial, or Garial, 94, 234
 Gay Lussac, M., and M. Biot, ascent
 in a balloon, 8
 Gazelle, 282
 Geesh Mountains, 280
 Geneva, Lake of, 26, 159
 Germany, Lower, 175
 — Upper, 163
 Georgia, 218
 Georgia, island of, 47
 Georgian Islands, 321
 Geysers of Iceland, 31
 Ghats, or Ghauts of India, 226
 Ginger, 238, 360
 Giraffe, 107, 293
 Glacier on Mount Etna, 272
 — Goodrun, 219
 Glens, 17
 Glen Coe, 123
 Glutton, 100, 190, 311
 Gnaphalium, 293
 Gnu, 293
 Goat, 107
 — Rocky Mountain, 311
 — Tibet, 245
 Gojam Mountains, 280
 Gold Coast, 297
 Goose, 97
 Gothland, 184
 Govatt's Leap, 378
 Gozo, island of, 272
 Grades of development in mammalia,
 109
 Graham's Island, 272
 — Land, 349
 Grain Coast, 297
 Grampian Mountains, 123
 Grampus, 107
 Grand Glockner, 162
 Grass-tree, 385
 Greece, 165
 — Islands of, 166
 Greenland, 90, 276, 322
 Grenadilla, 357
 Grizzly bear, 310
 Ground parrot, 391
 Grouse, 95, 190
 Grunting fish, 92
 Guachara, cavern of, 334
 Guadaloupe, 374
 Gualatieri, 367
 Guana. See Iguana.
 Guatemala, 354
 Guatemalan chesnut, 356
 Guiana, 338
 Guinea-fowl, 300
 Gulf Stream, 53
 — weed, or sargasso, 54
 Gum Arabic, 211
 — dragon, or Dragon's-blood tree
 301, 302
 — mastich, 172
 — tragacanth, 172

Gum tree. See *Eucalyptus*.

Gutta percha, 236

Gussub, 284

Gymnotas, 343

HABITATION OF PLANTS, term described, 63

Hæmus, Mount, 158

Hair-tail, or *Dasycurus*, 389

Hall, Colonel, and M. Boussingault, ascent of, on Chimborazo, 33

Hammerfest, 184

Hand plant, 357

Hannibal's Camp, 267

Hapales, 99

Hare, 103

— Alpine, or Pika, 182

Harmattan, 43

Hartz Mountains, 163

Havana, 357

Hawaii, 398, 401

Heath, 123, 292

Hebrides, 123

Hedaroma, 386

Helicon, 166

Helvelyn, 119

Hemlock spruce fir, 318

Hemp, 180

Herculaneum, 267

Herie, 288

Herring, 91

Hicory, 317

Highlands of Scotland, 120

Himalaya Mountains, 50, 231, 228

Hindoo Koh, 220

Hindustan, 226

Hippopotamus, 104, 288

Hit, fountains of bitumen near, 262

Hog, 104

Holland, 175

Honduras, 49

Honey guide, 293

Honey-eating birds, 391

Horeb, Mount, 209

Horse, 105

— Mongolian, or Dziggdal, 105, 246

Horses, wild, in Texas, 354

Hot springs, 31

Hottentot's bread, 293

Howling Monkey, 342

Humming birds, 95, 348, 360

Hungary, 52, 164

Hurricanes, 43

Hyacinth, 172

Hyana, 101, 293

Hymettus, Mount, 166

INDEX, 107, 161

Ibis, 156, 288

Iceland, 191, 276

Ichneumon, 100

Icononzo, natural bridge of, 331

Idumea, 206

Iguana, 357

Illimani, 326

Illyria, 162

— caverns of, 163

Imbaburu, 368

India, 226

— buried cities in, 258

— desert of, 227

— sacred bean of, 224, 233

Indian Archipelago, 235

— corn, 74

Indigo, 230

Indo-Chinese countries, 225

Indo-European languages, 113

Indus, valley of, 227

Inland seas, 25

Insectivora, 100

Insects, geographical distribution of, 85

— number of, 88

Insular climate, term described, 46

Inverness, 75, 123, 137

Ionian islands, 169, 266

Iraru, or Cartago, 371

Irawaddi, petroleum springs near, 257

Ireland, 126

Isatis, 101

Ischia, 267

Islands, 13

— general climate of, 46

Isles de Los, 304

Isothermal lines, 55

— in Great Britain, 128

Italy, 151

Ivory, 291

— coast, 297

Ixia, 293

JACARANDA, 346

Jacca, or Jack, 225

Jackal, 101

Jaguar, 102, 347

- Jamaica, 72, 374
 Jan Meyen's Island, 276
 Japan, 235, 253
Jatropha manihot, 73, 347
 Java, 246, 254
 Jebel Achmar, 303
 Jerboa, 282
 Jorat Mountains, 159
 Jorullo, 373
 Judea, 201
 Jura Mountains, 147

KAMTCHATKA, 251, 253
 Kangaroo, 103, 389
 Karroos, 283
 Kashmere, 226
 Katakakaumene, or Burnt Region,
 265
 Kandi pine, 391
 Kelvig, village of, 184
 Kenkra, 234
 Khoter, 246
 Kinchinjinga, 222
 Kiraueh, 401
 Kissa, 405
 Kong Mountains, 281
 Koordistan, 219
 Kosso's bottle, 293
 Krasnojask, 248
 Kuenlun Mountains, 243
 Kurile Isles, 239

LA PLATA, PLAINS OF, 344
 Labrador, 312
 — climate of, 45, 46
 Labuan, 236
 Lacker plant, 224
 Ladanum, gum, 172
 Lakes, 25
 Lamahmon, 280
 Lamantin, or *Manatus*, 107, 300
 Lampidosa, 156
 Land, general distribution of, 13
 — elevated, its influence on
 climate, 47
 — breezes, 42
 — rising of, in Scandinavia, 191
 Landak diamonds, 239
 Languages, affinity of, 113
 — analogy of, 114
 — families of, 113
 — American, 114
 — Chinese, 114
 — Indo-European, 113
 — Languages, Monosyllabic, 114
 — Polysynthetic, 114
 — Semitic, 113
 Lapland, 184
 Lark, 139, 233
 Laughing jackass, see *Dacelo*
 Lebanon, cedars of, 199, 281
 — mountains of, 199
Lecanora trimiata, 70
Lecythis, 342, 346
 Lemming, 190, 194
 Lemon tree in Palestine, produce of
 one, 202, *noté*
 Leopard, 101
 Lichens, 68, 101, 318, 334
 Lightning, effects of, 10
 Lima, 367
 Lignum aloes, 237
 Linden, or Lime-tree, 133, 179, 181
 Line of perpetual snow, 47
 Lion, 101, 293
 Lipari Islands, 153, 266, 272
 Liquorice plant, 211
 Lizard, 241, 395
 Llama, 107, 328
 Llanos, 19, 337
 Locusts, 156, 206, 212, 300
 Locust-tree, African, 298
 — American, or false
 acacia, 317
 — Eastern, or Carob-tree,
 145, 205
 Lodoicea, 301
 Logwood, 356
 Lombardy, 157
 London, environs of, mild climate of,
 71
 Longitude, table of, in different
 parallels, 113
 Lotos tree, 286
 Lotus, 289, 385
 Lowlands, 19
 — of Africa, 281
 — of America, 307, 311, 338
 — of Asia, 18, 247
 — of Europe, 174
 Luceira, 147
 Lupillon, 147
 Lynx, 102
 Lyre-tail, 389

MACAUO, 301
Maca, 333
 Macgillcuddy's Reeks, 128

- Mackarel, 92
 Mackaw, 347
 Madagascar, 300, 304
 Madeira, 303, 305
 Madrepora muricata, 357
 Magelhaen, Straits of, 324
 Magna Græcia, 155
 Magnolia, 69, 318
 Maguey, or Agave, 352
 Mahogany, 356
 Maize, 74, 148, 319
 Maladetta, 142
 Malay race, 111, 112
 Malay tapir, 241
 Malaya, peninsula of, 225
 Maldivas, 242
 Malta, 153, 272
 Mammalia, 98
 — grades of development in,
 109
 Mammee apple, 298, 359
 Man, geographical distribution of,
 110
 Manatus, 107, 300
 Manchineel, 360
 Mandioc, 73, 347
 Mango, 229
 Mangosteen, 230
 Mangrove, 237, 297
 Manis, or Pangolin, 103, 233
 Manna-ash, 72, *note*
 Maple, broad-leaved, 310
 — sugar, 317
 Mapu, 399
 Maranon, basin of, 342
 Maranta, 360
 Maremma, 152
 Marocco, 273, 285
 Marsi Niglak, pass of, 221
 Marsupiala, 103
 Mastich, gum, 172
 Mauritia, or eta palm, 341
 Mauritius, 301, 304
 Mean temperature, 55
 Melon, 290
 — cactus, 325
 Melville Island, America, 322
 — Australia, 298
 Menura, 389
 Merida, Sierra de, 333
 Meridional limits of plants, 171
 Merino sheep, 146
 Mesembryanthemum, 64, 289, 292
 Mesopotamia, 214
 Meteorite, 292, *note*
 Mexico, 350, 371
 Millet, or dhoorah, 74
 Mineral caoutchouc, 120
 Minerals, 9
 — of Africa, 284, 291, 298
 — the Alps, 162
 — Altai Mountains, 247
 — America, Central, 355
 — North, 314
 — South, 328, 344
 — Australia, 383
 — Belgium, 175
 — Bolivia, 326
 — Brazil, 344
 — California, 309
 — Chili, 325
 — China, 224
 — England and Wales, 119
 — France, 151
 — Galicia, 177
 — Germany, 163, 177
 — Hindostan, 234
 — Hungary, 164
 — Indian Archipelago, 235
 — Indo-Chinese countries,
 225
 — Ireland, 127
 — Japan, 235
 — Khoten, 246
 — Mexico, 351
 — Mongolia, 245
 — Netherlands, 175
 — Peru, 328
 — Russia, 178
 — Scandinavia, 185
 — Scotland, 125
 — Siberia, 247
 — Spain, 146
 — Uralian Mountains, 243
 — West Indies, 357
 Mineral-springs, 31
 Mingrelia, 218
 Mississippi, valley of, 311, 373
 Mistol, 345
 Mists, 37
 Moa, 394
 Moldavia, 170
 Mole, 99, 139, 320
 Mollusca, 83
 Moluccas, 237, 254
 Mona monkey, 299
 Mongolia, 245, 256
 Mongolian horse, 105, 246

- Mongolian race, 110
 Monkey, 98, 99
 Monosyllabic languages, 114
 Monsoons, 42
 Mont Blanc, 158
 — D'Or, 147
 — Mezene, 146
 Moon, mountains of the, 27, 280
 Moose-deer, 311
 Mora, 341
 Morea, 166, 174, 266
 Morocco. See Marocco.
 Mountain ash, 181
 Mountains, 13
 — position of, the effects of,
 on climate, 52
 Mouse, 103
 — economic, 252
 Mowna Koa, 401
 — Roa, 8, 401
 Mulahacen, 144
 Mulberry, black, 148, 174, 224
 — paper, 399
 — white, 224
 Musk-deer, 245
 — ox, 106, 320
 Musmon sheep, 106, 174
 Mydaus, 81
 Myrrh, 212, 290

 NAPHTHA, 261
 Naples, 152, 267
 Narcissus, 166, 172
 Narwhal, 107
 Naxos, Isle of, 169
 Negro, or Ethiopian race, 111
 Nepenthes, 238
 New Archangel, climate of, 45
 — Brunswick, 312
 — Holland. See Australia.
 — Orkneys, 349
 — Shetland Isles, 349
 — Zealand, 392
 — flax, 391
 Newfoundland, 313
 Ngami Lake, 26
 Niagara, fall of, 80
 Nibong palm, 238
 Niger, 284
 Nightingale, 212
 Nile, 287
 Nomenclature, geographical, 16
 Nopal tree, 354
 Norfolk Island pine, 385

 Norrland, 184
 Northern Highland of Europe, 182
 Norway, 182
 — rat, 220
 — spruce-fir, 71, 186
 Notornis, 394
 Nova Scotia, 312
 — Zembla, 89, 192
 Nubia, 287
 Nutmeg, 237
 Nuytsia, 386
 Nyghau, 233

 OAK, BRITISH, 130
 Oases, 19, 283
 Oats, 76, 134
 Ocean, divisions of, 24
 — its effects on climate, 46
 Oceanica, 14, 376
 Ocelot, 102, 353
 Odoriferous gums, 172, 290
 Oertler Spitz, 162
 Offing at sea, 7
 Oil-palm, 299
 Olan, 158
 Olibanum, or frankincense, 212, 230
 Olive, 75, 145, 148
 Olympus, Asia, 196
 — Europe, 166
 Onager, or wild ass of the desert,
 246
 Onion, 289
 Opal, 165
 Ophir, 291
 Opossum, 103, 389
 — Virginian, 320
 Opuntia, 354
 Orange, 148, 223, 384
 Orang-outan, 240
 Orchel, 303
 Origanum Tournefortii, 63
 Orinoco, basin of, 338
 Orizaba, 371
 Orkney Islands, 124
 Ornithorynchus, 103, 389
 Orycteropus, or Cape ant-eater, 103,
 293
 Ostrich, 95, 282
 Otter, 140
 Oujein, buried cities near, 258
 Ouralian Mountains. See Uralian..
 Owwhyee. See Hawaii.
 Owl, 96
 — Virginian, 321

Ox-eye, 43

Oxus, valley of, 247, 260

PACHYDERMATA, 104

Painted lady-butterfly, 89, 90

Palm-trees, 68, 148, 333, 393

Palmer's Land, 349

Palmetto, or Dwarf Palm, 148, 285

Palmyra, 214

—— palm, 230, 238

Palo de vaco, or Cow-tree, 337

Pampas, 30, 337, 344

Pamperas, 43

Pandanus, or Screw pine, 73, 359, 386

—— candelabrum, 299

Pangolin, or Mania, 103, 233

Panther, 101

Papaw-tree, 359

Paper Mulberry, 399

Papyrus, 289

Paraguay tea, 345

Parallel roads, 17

Parapomisan Mountains, 218

Paris, climate of, 71

Paros, isle of, 169

Parnassus, Mount, 166

Parroquets, 347, 389

Parrots, 241, 347, 391

Partridge, 139

Pasco, 34, 327

Passaic, fall of the, 314

Passenger pigeon, 321

Passion flower, 359

Pasto, 368

Patagonia, 324, 344, 374

—— rain in, 39

Patagonian cavy, 347

Peach, 219

—— of the negroes, 298

Peccari, 104, 347

Pechan, 256

Pekin, climate of, 56, 225

Pelican, 348

Pelvoux, 158

Penguin, 349

Pepper, 225

Perdu, Mont, 143

Persia, 219

Peru, 327, 367

Petaurus, 389

Petroleum, 120, 257, 261, 362

—— volcano, 362

Phalanger, 183

Pheasant, 224

Philippines, 254

Phlegrean fields, 267

Phormium tenax, 393

Physical geography, advantages of, 3

—— its importance, 1, 403

—— its objects, 2

Pia, 399

Pichincha, 367

Piedmont, 155

Pigeons, 95, 321, 391

Pika, or Alpine hare, 182

Pilate, Mont, 160

Pimento, 359

Pine, or Scotch fir, 134, 186

Pine-apple, 347, 359

Pistacia, 145, 172, 205

Pistachio nuts. See Pistacia.

Pitcher-plant, 238

Pitch-lake of Trinidad, 359

Plainejou, 266

Plains, 13

—— of Africa, 19, 281

—— America, 19, 311, 343

—— Asia, 18, 247

—— Europe, 18, 174

—— Germany, 175

—— La Plata, 20, 344

—— Russia, 178

—— Siberia, 18, 247

Plane-tree, American, 317

Plantain, 73, 230

Plant-cutter, 326

Plantigrada, 100

Plants, geographical distribution of, 62

—— meridional limits of, 171

—— number of species, 72

Plateaus. See Table-lands.

Platypus. See Ornithorynchus.

Poland, 52, 177

Polar bear, 100, 148, 320

—— currents, 53

Polignano, caverns near, 153

Polistena, fissures formed near, 271

Polynesia, 397

Polynesian volcanic region, 400

Polysynthetic languages, 114

Pomegranate, 145, 202

Pompeii, 267

Poplar, Hudson's Bay, 317

—— Italian, 154

Popocatepetl, 371

Porcupine, 103, 233

- Porcupine, prehensile, or Brazilian,
 108, 347
 — fish, 92
 Porpoise, 107, 141
 Portugal, 148, 278
 Potato, 76, 325
 Potosi, 328
 Prairies, 19, 311
 Prince's Island, 305
 Progressive earthquakes, 255, 274
 Protæaceæ, 292, 385
 Proteus anguinus, 95, 164
 Ptarmigan, 96, 321
 Pulque, 352
 Puma, 102, 347
 Pyrenees, 148, 278
 Python, 94

 QUA MOUNTAINS, 281
 Quadrumana, 98
 Quadrupeds, mammiferous, 97
 Quagga, 293
 Quails, 156, 288, 391
 Quassia, 342
 Quebradas, 325, 345
 Quinquina, 329, 333
 Quito, 329
 Quorra, 284

 RADIATA, 82
 Rafflesia, 239
 Rain, 38
 Ranunculus, 172
 Rapids, 28
 Rat, 108, 387
 — blind, or Spalax, 220
 — Norway, 220
 Rattana, 237
 Rattlesnake, 94
 Redbreast, 97
 Red Sea, bed of, 83
 — snow, 322
 Reindeer, 106, 190, 311
 — moss, 189
 Reptilia, 93
 Resina, 268
 Rhea Americana, 95, 346
 Rhine, 27, 159, 178
 Rhinoceros, 104, 225, 293
 Rhododendron, 228, 318
 Rhone, 27, 159
 — valley of, 159
 Rice, 74, 155, 224, 319
 Rio Negro, 345

 Riobamba, 368
 Rivers, 27
 Robinia, or False Acacia, 69, 317
 Rocks on the earth's surface, 9
 Rocky Mountains, 14, 306, 375
 Rodentia, 102
 Romania, or Roumelia, 170
 Rosa, Monte, 158
 Rosarno, circular hollows near,
 270
 Rose-trees, 219
 Rosewood, 346
 Roussette bat, 99, 240
 Ruminantia, 105
 Rumli Mountains, 281
 Russia, 178
 Rye, 76, 134, 177
 Rytina, 107

 SABLE, 100, 251
 Sacred bean of India, 224, 233
 Sago palm, 225, 238
 Sahara, or Sahra, 19, 282
 Sahel, 288
 Salamander, 94
 Salmon, 91
 Salt-mines of Galicia, 177
 Samen Mountains, 280
 Samothraki, 169
 Sand hills in Arabia, 210
 — South America, 344
 Sandal wood, 229
 Sandwich Islands, 401
 — Land, 349
 Santa Fé de Bogota, 333
 — Maria, island of, 366
 Santorini, 169, 265
 Sapucaya-nut, 346
 Sapindus saponaria, 346
 Sargasso, 54
 Sassanage, grotto of, 147
 Sauroid fishes, 92
 Savannahs, 19, 311
 Saw-fish, 92
 Saxifrages, 64, 318
 Scandinavia, 182
 — rising of land in, 191
 Scio, island of, 172
 Scorpion, 85, 301
 Scotch fir, or Pine, 134, 186
 Scotland, 120
 Screw-pine, or Pandanus, 73, 354,
 386
 — branching, 299

- Sea-breezes, 42
 Sea-island cotton, 319
 Sea-slug, or beche de mer, 84, 392
 Seals, 102, 396
 Seas, 25
 Secretary bird, 293
 Secta Cunda Hills, 258
 Semitic languages, 113
 Senegal, 284
 Sepia, or cuttle-fish, 84
 Serpents, 93
 Sesamum, 224
 Sevellan, Mount, 214, 263
 Seychelles Islands, 301
 Shark, 92
 Shea, or butter-tree, 298, 299
 Sheep, 105
 — in Finland, 190
 — South America, 109
 — Merino, 146
 — Rocky Mountain, 311
 — Tibet, 245
 Shetland Isles. See Zetland.
 — New South, 349, 361
 Siam, 225
 Siberia, 247
 Sicily, 82, 153, 271
 Sierra Leone, 284
 — Nevada, 144
 Silk cotton-tree, or Bombax, 298, 342
 Simplon, 158
 Simun, or Simoom, 43
 Sinai Mount, 209
 Sinde, 227
 Siphonia elastica, 346
 Sirocco, 43
 Sitka, climate of, 45
 Sloth, or ai, 103, 347
 Snow, perpetual line of, in different
 parallels, 48
 Snow-bunting, 195, 319, 353
 Snowdon, 119
 Soap-beads, 346
 Society Islands, 398
 Sofala, 291
 Soil, its influence on climate, 52
 Solano, 43
 Solanum sodomæum, 202
 Sole, 91
 Solfatara, term described, 305, *note*
 Solimaun Mountains, 219
 Southampton Island, 321
 Spain, 144
 Spanish potato, 73, 347
 Sparrow, 97
 Spider, 85
 — gigantic, 348
 Spitzbergen, 51, 72, 195
 Splügen, 161
 Springbok, 293
 Springs, 31
 — hot, or thermal, 31
 Squirrel, 102, 320
 St. Bernard, Mont, 34, 158
 — Bernardin, Mont, 161
 — Domingo, 374
 — Elias, Mount, 375
 — Gothard, Mont, 159
 — Helena, 302, 304
 — Lawrence, 375
 — Vincent's, 373
 — Winifred's Well, 31
 Staffa, 124
 Stapelia, 292
 Stations of plants, 62
 Stoat, 140
 Stromboli, 153, 272
 Sturgeon, 91, 247
 Styria, 162
 Sudis gigas, 343
 Sugar-cane, 74, 155, 237, 319
 — maple, 317
 Sumatra, 239, 254
 Sumbawa, 254
 Sun-birds, 95, 300
 Surinam toad, 348
 Surturbrand, 192
 Swallow, 97
 Swan, black, 389
 Sweden, 184
 Sweet potato, 73, 347
 Switzerland, 159
 Sword-fish, 92
 Sycamore-fig, 206
 — maple, 134
 Syria, 199, 264

 TABLE of heights of mountains, 21
 — longitude, 118
 — perpetual snow line, 47, 48
 Table lands, 20
 — illustration of their effects on
 climate, 49
 — of Africa, 21
 — Dukhun, 21, 226
 — Mexico, 350, 371
 — Persia, 21, 219
 — Quito, 21, 329

Table Lands of Riobamba, 21
 ——— Spain, 20, 145
 ——— Tibet, 20, 244
 Table Mountain, 281
 Tailor-bird, 234
 Talcahuano, 365
 Tallow-tree, 225
 Tamarind, 212
 Tamus elephantopus, 293
 Tapioca, 73, 346
 Tapir, 104
 ——— American, 347
 ——— hairy, 327
 ——— Malayan, 241
 Tasmania, or Van Diemen's Land,
 382
 Taurus Mountains, 196
 Tea-plant, 224, 225
 ——— Paraguay, 345
 Teak-tree, 229
 Tees, fall of, 28
 Telfairia, 291
 Temperature, its influence on vege-
 tation, 64
 Tenerife, 8, 302, 305
 Tequendama, cataract of, 30
 Terebinth, gum, 172
 ——— tree, 205
 Termites, 156, 300
 Ternate, 254
 Testacea, 84
 Texas, 354
 ——— cross timber in, 311
 Thibet. See Tibet.
 Thurr, or Desert of India, 227
 Thylacurus, 389
 Tibet, 20, 244
 ——— goat, 107, 245
 ——— sheep, 106, 245
 Tibet Panjahl, 221
 Tidore, 254
 Tierra del Fuego, 323, 361
 Tiger, 101, 233
 Tigris, 214
 Titicaca, 27, 327
 Toad, 94
 ——— Surinam, 343
 Tobacco, 319
 Tofus, 398
 Tollima, pic de, 333
 Tomboro, 254
 Tongataboo, 398
 Tonkin, 225
 Tonquin-bean, 342

Tornadoes, 43
 Tortoise, 93, 301
 ——— shell, 241
 Toucan, 348
 Trade-winds, 41
 Tragacanth gum, 172
 Trepang, 84, 392
 Tridacna gigas, 84
 Trinidad, 359
 ——— Pitch Lake of, 359
 Tripe de roche, 318
 Tristan d'Acunha, 304
 Trout, 91
 Tchad Lake, 26, 284
 Tui, 395
 Tuitui, 399
 Tullegalla, 389
 Tnlip, 172
 ——— tree, 69, 317
 Tunguragua, 368
 Turkey, 165
 ——— (bird), 321
 Turkistan, 246
 Turtle, 94, 360, 392
 Tuscany, 152
 Tuxtla, 371
 Typhons, 43
 UNITED STATES, 310
 Upas tree, 237
 Uralian Mountains, 178, 243
 Urus, or Zubr, 181
 VALAIS, or Valley of the Rhone, 17,
 159
 Valdai Hills, 18, 178
 Valleys, 17
 ——— of the Andes, 330
 ——— Pyrenees, 143
 Valparaiso, 363
 Vampire, 99, 342
 Van, Lake of, 25, 213
 Van Diemen's Land, or Tasmania,
 382
 ——— climate of, 47
 Vanilla, 342
 Vega, 144
 Vegetation, influence of temperature
 on, 64
 ——— varied, of the earth, 63
 Venezuela, 337
 Vertebrata, 90
 Vesuvius, 152, 267
 Via Mala, 161

- Victoria Land (south), 395
 Victoria Regina, 342
 Villarica, 362
 Vine, 75, 148, 199, 202, 308, 385
 Viso, Monte, 158
 Volcanic eruptions in Baku, 261
 — Coseguina, 369
 — Cotopaxi, 367
 — Etna, 271
 — Jorullo, 373
 — Kiraueh, 399
 — Morne Garou, 374
 — Papandayang, 255
 — Skaptar Yokul, 276
 — Tomboro, 254
 — Tunguragua, 368
 — Vesuvius, 267
 — Yanteles, 365
 Volcanic islands, newly formed, near
 Aleutian Isles, 253
 — Azores, 274
 — Grecian Archipelago, 265
 — Iceland, 276
 — Ionian Isles, 266
 — Juan Fernandez, 366
 — in Mediterranean Sea, 275
 Volcanic islands in Sea of Azof, 264
 Volcanic regions, 11
 — of Africa, 303
 — from the Aleutian Isles to
 the Moluccas, 253
 — of the Andes, 361
 — from the Caspian to the
 Azores, 261
 — from Formosa to the
 Caspian Sea, 256
 — of Iceland, 276
 — of Polynesia, 400
 Volcanos, active, in Aleutian Isles, 253
 — Alyaska, 375
 — Ankober, near, 304
 — Azores, 274
 — Barren Island, 254
 — Bashee Islands, 254
 — Bengal, 258
 — Bolivia, 367
 — California, 374
 — Canaries, 305
 — Central America, 369
 — Chili, 362
 — Colombia, 367
 — Cutch, 258
 — Grecian Archipelago, 265
 — Guadaloupe, 374
 — Volcanos, active, in Hawaii, 398, 401
 — Iceland, 276
 — India, 258
 — Indian Archipelago, 254
 — Italy, 266
 — Jan Mayen's Island, 276
 — Japan, 253
 — Java, 254
 — Kamtchatka, 253
 — Kurile Isles, 253
 — Lipari Islands, 272
 — Luzon, 254
 — Mexico, 371
 — Milo, 265
 — Moluccas, 254
 — Mongolia, 256
 — New Zealand, 392
 — Patagonia, 362
 — Peru, 367
 — Philippines, 254
 — Rocky Mountains, 375
 — Santorini, 265
 — Sicily, 271
 — South Victoria Land, 395
 — St. Vincent's, 374
 — Stromboli, 272
 — Sulphur Island, 254
 — Sumatra, 254
 — Sumbawa, 254
 — Tierra del Fuego, 361
 — Tofua, 398
 — West Indies, 374
 Volute shells, 84
 Vordati, 405
 Vosges Mountains, 147
 Vulture, 96, 164
 WAART HOG, or Engallo, 104
 Wadya, 19, 282
 Wales, 119
 Wallachia, 170
 Wallachian sheep, 106
 Walnut, 317
 Walrus, 102
 Walvisch Bay, 292, 297
 Wapiti deer, 320
 Water, boiling-point of, 33
 — general distribution of, 24
 Waterfalls, 28
 Water-sheds, 27
 Water volcano, 368
 Wattle-trees, or Australian acacias,
 385
 Wax-bearing palm, 346

- Wax coated palm, 334
 — or tallow-tree, 225
 Weasels, 100
 Weaver-birds, 284, 294
 West Indies, 356, 374
 Weymouth pine, 317
 Whale, 107
 Wheat, 71, 75, 134
 — introduction of, into America, 329
 Whirlwinds, 43
 Whiting, 91
 Wild boar, 104, 178
 — vines, 202
 Willow, 70, *note*
 — dwarf, 180
 Winds, 40
 Wingen, Mount, 378
 Wolf, 101, 148
 Wolverine, or glutton, 100, 190, 311
 Wombat, 387

XANTHORRHEA, 385

YAK, 106, 245
 Yam, 73, 399
 Yanteles, 362
 Yungling Mountains, 222

ZAGROS MOUNTAINS, 219
 Zamia, 385
 Zebra, 104, 293
 Zebu, or buffalo, 106
 Zetland Isles, 124
 Zirknitz, Lake of, 164
 Zoarces polaris, 92
 Zoology of Africa, 282, 288, 293, 299
 — America, North, 310, 319
 — Arabia, 212
 — Australia, 389
 — Zoology of Brazil, 346
 — British Isles, 187
 — Caucasian region, 219
 — Central America, 357
 — Chili, 326
 — China, 224
 — East Indian Archipelago, 240
 — France, 148
 — Greece, 173
 — Guiana, 342
 — Hindostan, 233
 — Hungary, 164
 — Iceland, 192
 — Indo-Chinese countries, 225
 — Italy, 156
 — Japan, 235
 — Judea, 206
 — Kamtchatka, 249
 — Madagascar, 300
 — Malta, 156
 — Mexico, 353
 — Mongolia, 246
 — New Zealand, 394
 — Nova Zembla, 194
 — Persia, 220
 — Peru, 328
 — Portugal. See Spain.
 — Russia (European), 181
 — Scandinavia, 190
 — Siberia, 251
 — Sicily, 156
 — Spain, 146
 — Switzerland, 160
 — Texas, 354
 — Tibet, 245
 — Turkey, 173
 — West Indies, 360
 — Zabr, or Urus, 101, 141, 181

LONDON :
SAVILL AND EDWARDS, PRINTERS,
CHANDOS STREET.

EDUCATIONAL BOOKS.

PUBLISHED BY

JOHN W. PARKER AND SON, WEST STRAND.

Outlines of the History of England. Cheaper Edition.
1s.

Outlines of the History of Ireland. By O. COCKAYNE,
M.A., one of the Classical Masters, King's College School. 1s.

Outlines of the History of France. By O. COCKAYNE,
M.A. 1s. 3d.

Outlines of Roman History. With Wood-cuts, &c. 10d.

Outlines of Grecian History. By the Rev. B. BOUCHIER,
M.A. With Maps and Views. 1s.

Outlines of Sacred History. Cheaper Edition. 2s. 6d.

Outlines of Ecclesiastical History. By Rev. W. H.
HOARE, M.A., late Fellow of St. John's College, Cambridge. 2s. 6d.

Bible Narrative chronologically arranged. With
Maps. 7s.

Elements of Ancient History. With Questions. 2s.

Elements of Modern History. With Questions. 2s.

School History of England, abridged from Gleig's
Family History; with Chronology, List of Contemporary Sovereigns, and Questions. 6s.

'The best of the numerous class especially written for instruction.'—
Quarterly Review.

Analysis of English History, and of French History.
By DAWSON W. TURNER, M.A., Head Master of the Royal Institution, Liverpool. 2s.

Analysis of Roman History. By the same. 2s.

First Ideas of Geography for Beginners. 1s.

Outlines of Geography. With Maps. 10d.

Descriptive Geography, a Familiar Account of the various Countries of the World. With Popular Statistics. 2s.

Outlines of Geology. By Miss R. M. ZORNLIN. With Illustrations. 10d.

Outlines of Physical Geography. By Miss R. M. ZORNLIN. With Maps. 10d.

Recreations in Physical Geography. By the same Author. With Woodcuts and Plates. 6s.

Guyot's Earth and Man; or, Physical Geography in its relation to the History of Mankind. Slightly abridged, with corrections and notes. 2s. 6d.

Manual of Ancient Geography. By W. L. BEVAN, M.A., Vicar of Hay. 2s. 6d.

Hand-Book of Bible Geography. A brief alphabetical description of the ancient and modern condition of the chief places mentioned in the Bible. 2s.

Bible Maps for Schools; with brief descriptions. Sewed, 3s.

Bible Maps; an Historical and Descriptive Atlas. With copious Index. By W. HUGHES, F.R.G.S. 7s. 6d. coloured.

Outline Scripture-Maps: By J. R. MAJOR, M.A., one of the Classical Masters in King's College. With Key, 3s.

Manual of Geographical Science. The First Part containing Mathematical Geography, by M. O'BRIEN, M.A., Professor of Natural Philosophy in King's College. Physical Geography, by D. T. ANSTED, M.A., F.R.S., Professor of Geology in King's College. Chartography, by J. R. JACKSON, F.R.S., late Secretary of the Royal Geographical Society. Terminology and Theory of Description, by the Rev. C. G. NICOLAY, Librarian of King's College. 8vo. 10s. 6d.

Atlas of Physical and Historical Geography. Engraved by J. W. LOWRY. Under the direction of PROFESSOR ANSTED and the Rev. C. G. NICOLAY, F.R.G.S. 5s.

Outlines of Chemistry. By T. GRIFFITHS. 10d.

Outlines of Astronomy. By Professor HALL, of King's College. 10*d*.

An Astronomical Vocabulary. By J. R. HIND, Foreign Secretary of the Astronomical Society. 1*s*. 6*d*.

Elements of Algebra. By Professor HALL, of King's College. Cheaper Edition. 5*s*.

Figures of Euclid, with Geometrical Exercises. By J. EDWARDS, M.A., of King's College School. Cheaper Edition. 2*s*.

Popular Poems, Selected by E. PARKER. Cheaper Edition. 2*s*. 6*d*.

Readings in Poetry. Cheaper Edition. 3*s*. 6*d*.

Readings from Shakspeare. Edited by the Author of "Aids to Development." 4*s*. 6*d*.

Readings in Prose. Cheaper Edition, 3*s*. 6*d*.

Readings in Biography. Cheaper Edition, 3*s*. 6*d*.

Readings in Science. Cheaper Edition, 3*s*. 6*d*.

Class Reading Book. By G. LUDLOW, of Christ's Hospital. 3*s*.

Abbott's Reader. Familiar Pieces in Prose and Verse. By the Author of the "Young Christian." 3*s*.

Practical Introduction to English Composition. By J. EDWARDS, M.A., of King's College. 2*s*.

Useful Arts employed in the Production of Food. 2*s*. 6*d*.

Useful Arts employed in the Production of Clothing. 2*s*. 6*d*.

Useful Arts employed in the Construction of Dwelling Houses. 2*s*. 6*d*.

Natural Philosophy for Beginners. Cheaper Edition, with 143 Illustrations. 2*s*.

Le Tellier's French Grammar, practically adapted for English Teaching. By J. F. WATTEZ, one of the French Masters, King's College, London. 4s.

Ventouillac's Rudiments of the French Language; or, First French Reading-Book. Edited by J. F. WATTEZ. 3s. 6d.

Colloquial Exercises on the most Familiar Idioms of the French Language. By J. F. WATTEZ. 2s. 6d.

Practical Exercises on French Phraseology. By PROFESSOR BRASSEUR, of King's College. 3s. 6d.

Livre de Classe; with English Notes. By the late PROFESSOR VENTOUILLAC, of King's College. 5s.

French Poetry; with Notes by the same. 2s.

French Classics; abridged in a new form; and graciously permitted by Her Majesty to be used as Educational Works for the Instruction of the Royal Children of England. By MARIN DE LA VOYE, late French Master at Addiscombe.

Télémaque. 2s. 6d.

Voyages de Cyrus. 2s.

Bélisaire. 1s. 6d.

Pierre le Grand. 2s.

Charles XII. 2s.

Gil Blas. 4s.

By PROFESSOR BERNAYS, of King's College, London.

German Word Book. 3s.

German Phrase-Book. 3s.

German Conversation Book. 3s.

German Grammar. 5s.

German Exercises. 5s. 6d.

German Examples, forming a Key to the Exercises. 3s.

German Reader, with Translations and Notes. 5s.

German Historical Anthology. 5s.

German Poetical Anthology. 7s.

Schiller's Maid of Orleans. With Notes. 2s.

Schiller's William Tell. With Notes. 2s.

Latin Grammar for Ladies. By R. W. BROWNE, M.A.,
Professor of Classical Literature in King's College, London. 1s. 6d.

Complete Latin Grammar for Learners. By J. W.
DONALDSON, D.D., Head Master of King Edward's School, Bury
St. Edmunds. 3s. 6d.

Exercises adapted to the Complete Latin Grammar.
By Dr. DONALDSON. 2s. 6d.

**Latin Exercises for the Junior Classes of King's
College School.** By the Rev. Dr. MAJOR, Head-Master. 2s. 6d.

Latin Exercises for Middle Forms in Schools. By the
Rev. J. EDWARDS, M.A., Second Master of King's College
School. 4s.

**Rules and Exercises in the Use of the Latin Sub-
junctive Mode.** By the Rev. J. CROCKER, M.A. 4s.

Progressive Exercises in Latin Lyrics. By the Rev.
J. EDWARDS. 3s.

Key to the Exercises in Lyrics. 2s. 6d.

Progressive Exercises in Latin Elegiacs and Heroics.
By the same. 3s.

**Catiline and Jugurtha of Sallust; with ANTHON'S
Notes.** Edited by the same. 2s. 6d. each.

Select Orations of Cicero, with English Notes. By a
Master of King's College School, London. 2s. 6d.

Select Epistles of Cicero and Pliny. With English
Notes. By the Rev. J. EDWARDS. 4s.

Æneid of Virgil, with ANTHON'S Notes. Edited by
J. R. MAJOR, D.D., Head Master of King's College School. 7s. 6d.

**C. Cornelii Taciti Opera ad Codices Antiquissimos,
Commentario Critico.** Edidit FRANCOISCUS RITTER, Professor
Bonnensis. Complete in Four Volumes. Octavo. 28s.

**Aulularia and Menæchmei of Plautus, with Notes by
JAMES HILDYARD, B.D., Fellow of Christ's College, Cambridge.**
7s. 6d. each.

Græcæ Grammaticæ Rudimenta. Constructionis
Græcæ Præcepta; editio altera, cui præfixa est legitima declinandi conjugandique ratio. 2s. 6d.

Also, strongly bound, 4s. 6d.

Complete Greek Grammar for Learners, by JOHN W. DONALDSON, D.D., Head Master of King Edward's School, Bury St. Edmund's.

First Greek Reader, from the German of JACOBS, with English Notes. By the Rev. J. EDWARDS, M.A., of King's College, London. Fourth and Cheaper Edition. 4s.

Excerpta ex Herodoto; with English Notes. By Dr. MAJOR, Head Master of King's College School. 4s. 6d.

Excerpta ex Xenophontis Cyropædia; with a Vocabulary and Notes. By the same. 3s. 6d.

Xenophon's Anabasis of Cyrus. I. and II. With English Notes, and Biographical Sketch, by Dr. HICKIE, Head Master of Hawkeshead Grammar School. 3s. 6d.

Homer's Iliad. Books I. to III. With ANTHON'S Notes, and Glossary. Edited by Dr. MAJOR. 6s.

Cambridge Greek and English Testament, printed in parallel columns on the same page. Edited, for the Syndics of the University Press, by Professor SCHOLEFIELD. 7s. 6d.

Cambridge Greek Testament. Strongly bound, 3s. 6d.

The Greek Text of the Acts of the Apostles. With English Notes. By H. ROBINSON, D.D. 8s.

Selections from the Greek Verses of Shrewsbury School; with an Account of the Iambic Metre and Style of Greek Tragedy, and Exercises in Greek Tragic Senarii. By B. H. KENNEDY, D.D., Head Master of Shrewsbury School. 8s.

Select Private Orations of Demosthenes. With English Notes. By the Rev. C. T. PENROSE, M.A., Head Master of Sherborne School. 5s.

Frogs of Aristophanes. With English Notes. By Rev. H. P. COOKESLEY. 7s.

Becker's Gallus ; or, Roman Scenes of the Time of Augustus. With Notes and Excursuses illustrative of the Manners and Customs of the Romans. Translated by F. METCALFE, M.A., Fellow of Lincoln College, Oxford. 12s.

Becker's Charicles ; or, Illustrations of the Private Life of the Greeks. Translated by F. METCALFE, M.A. 12s.

Student's Manual of Ancient History : Political History, Geographical Position, and Social State of the Principal Nations of Antiquity. By W. C. TAYLOR, LL.D. 10s. 6d.

Student's Manual of Modern History : Rise and Progress of the Principal European Nations, their Political History, and the Changes in their Social Condition. By W. C. TAYLOR, LL.D. 10s. 6d.

Travels in the Track of the Ten Thousand Greeks ; a Geographical and Descriptive Account of the Expedition of Cyrus, and of the Retreat of the Ten Thousand, as related by Xenophon. By W. F. AINSWORTH, F.G.S. 7s. 6d.

Neander's Julian the Apostate and his Generation : an Historical Picture. Translated by G. V. COX, M.A. 3s. 6d.

Classical Examination Papers of King's College, London. By R. W. BROWNE, M.A., Professor of Classical Literature in King's College. 6s.

Aristophanis Comœdiæ Vndecim, cum Notis et Indice Historice. Edidit HYBERTVS A. HOLDEN, A.M., Coll. Trin. Cant. Socius ac Tutor. Octavo. 15s. The Plays separately, 1s. each. Notulæ Criticæ and Onomasticon. 4s.

Dahlmann's Life of Herodotus drawn out from his Book. Translated, with Notes, by G. V. COX, M.A. 5s.

Life of Aristotle, including a Critical Discussion of some Questions of Literary History connected with his Works. By J. W. BLAKESLEY, B.D., late Fellow and Tutor of Trinity College, Cambridge. 8s. 6d.

Schleiermacher's Introductions to the Dialogues of Plato. Translated by the Rev. W. DODSON, M.A., Fellow of Trinity College, Cambridge. 12s. 6d.

Fables of Babrius ; with the Fragments of the lost Fables. Edited by G. CORNEWALL LEWIS, M.A. 5s. 6d.

Pindar's Odes, revised and explained; with copious Notes and Indices. By J. W. DONALDSON, D.D., Head Master of Bury School. 16s.

Bœckh's Public Economy of Athens. Translated by G. C. LEWIS, A.M., late Student of Christ Church. Octavo. 18s.

Speeches of Demosthenes against Aphobus and Onetor. Translated, with Explanatory Notes, by C. R. KENNEDY, M.A., Fellow of Trinity College, Cambridge. 9s.

Stemmata Atheniensia; Tables of Biography, Chronology, and History, to facilitate the Study of the Classics. 5s.

Homeric Ballads: the Greek Text, with a Metrical Translation and Notes. By the late Dr. MAGINN. 6s.

CLASSICAL TEXTS,

Carefully Revised, from the best Editions.

Æschyli Eumenides. 1s.

Æschyli Prometheus Vincetus. 1s.

Cæsar de Bello Gallico. I. to IV. 1s. 6d.

Cicero de Senectute. 1s.

Cicero de Amicitia. 1s.

Cicero de Officiis. 2s.

Cicero pro Plancio. 1s.

Cicero pro Milone. 1s.

Cicero pro Muræna. 1s.

Ciceronis Oratio Philippica Secunda. 1s.

Demosthenes in Leptinem. 1s.

Demosthenes against Aphobus and Onetor. 1s. 6d.

Euripidis Bacchæ. 1s.

Excerpta ex Arriano. 2s. 6d.

Excerpta ex Luciano. 2s. 6d.

Excerpta ex Taciti Annalibus. 2s. 6d.

Horatii Satiræ. 1s.

Horatii Carmina. 1s. 6d.

Horatii Ars Poetica. 6d.

Ovidii Fasti. 2s.

Platonis Phædo. 2s.

Platonis Menexenus. 1s.

Platonis Phædrus. 1s. 6d.

Plutarch's Lives of Solon, Pericles, and Philopœmen. 2s.

Sophoclis Philoctetes, with English Notes. 2s.

Sophocles Œdipus Tyrannus, with English Notes. 2s. 6d.

Taciti Germania. 1s.

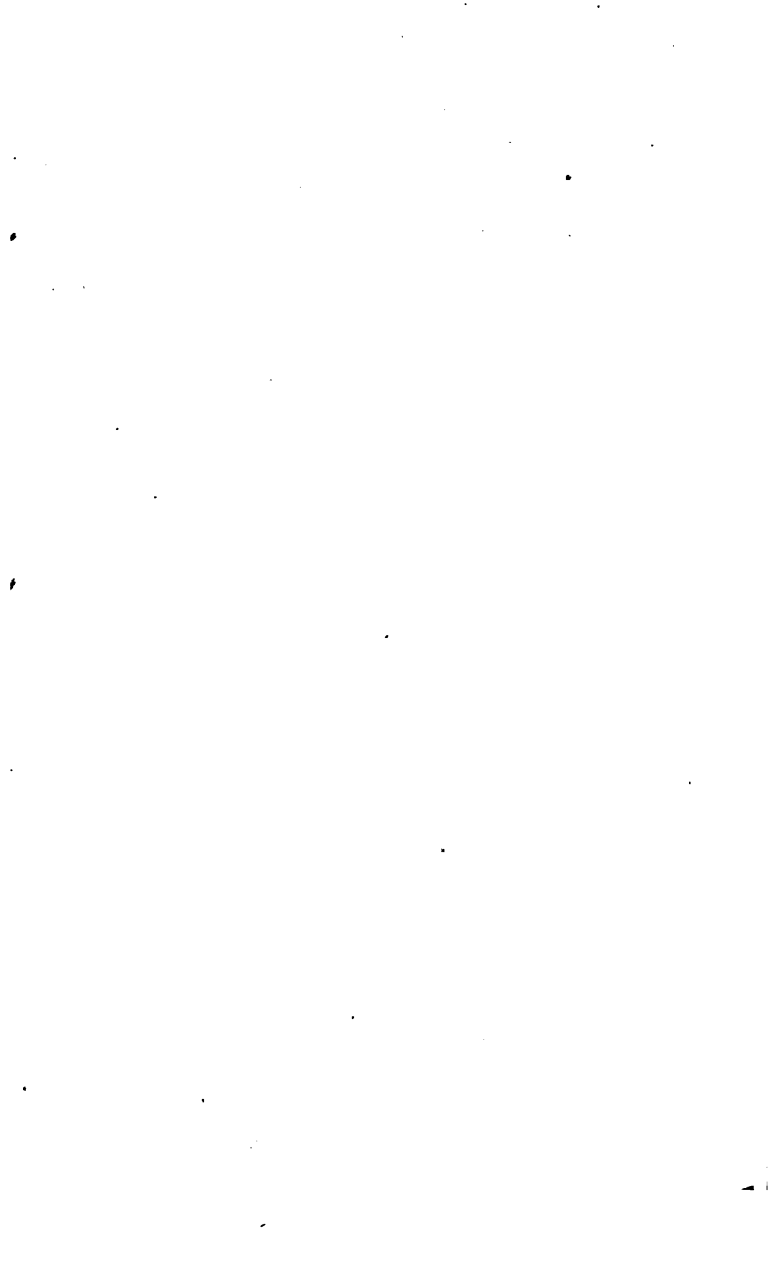
Taciti Agricola. 1s.

Terentii Andria. 1s.

Terentii Adelphi. 1s.

Virgilii Georgica. 1s. 6d.

LONDON: JOHN W. PARKER AND SON, WEST STRAND,



WORLD FOR US
1970-1981

GB60 .286

Recreations in physical geography :

Kimmel Library

AGG6041

3 2044 032 822 561

**DO NOT REMOVE
FROM LIBRARY**